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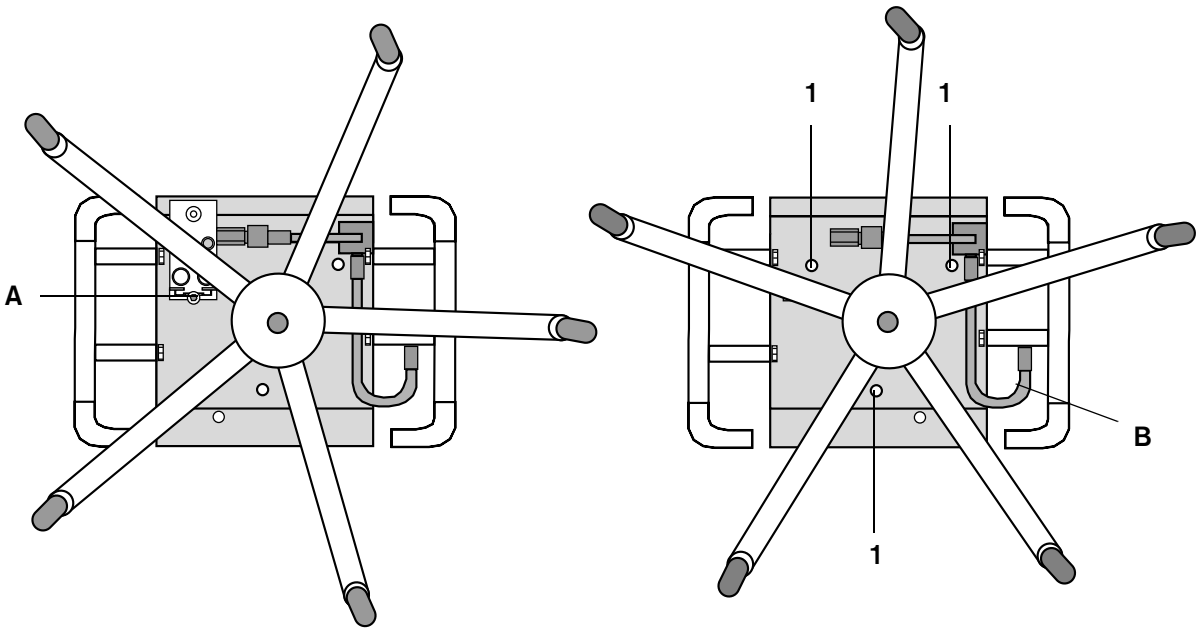
Repair Instructions MicroVent

1. Removing the MicroVent from the Trolley



- Remove the screw **A** (fixing point mixer).
- Loose hose **B** (connected to microvent)
- Remove the screws **1**.

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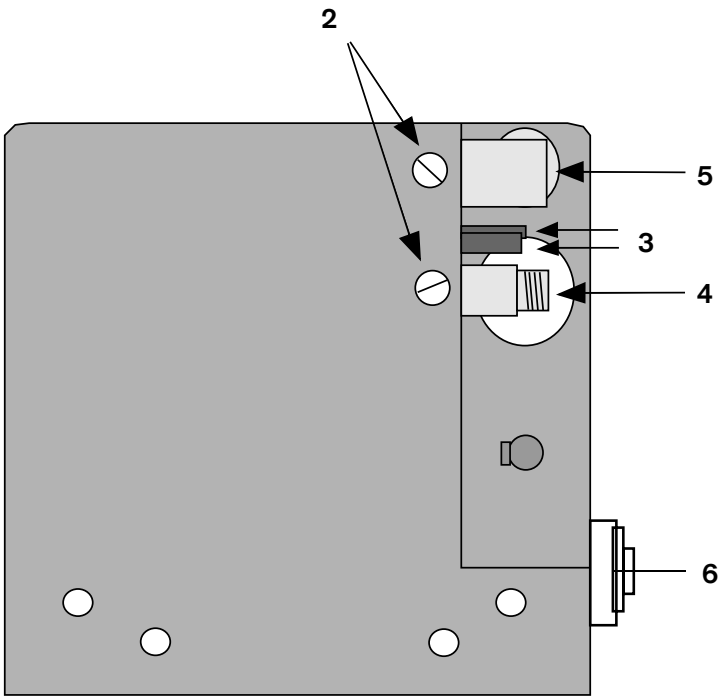
2. Opening the MicroVent

Top View



Important:

When removing the screws **2** and **3** note the length/diameter of the screws for later reassembly.

- Remove the screws **2** and **3** makes sure not to lose the washers.
- Pull out the gas connection **4** and the patient outlet **5.**
- Remove the expiratory valve **6**.

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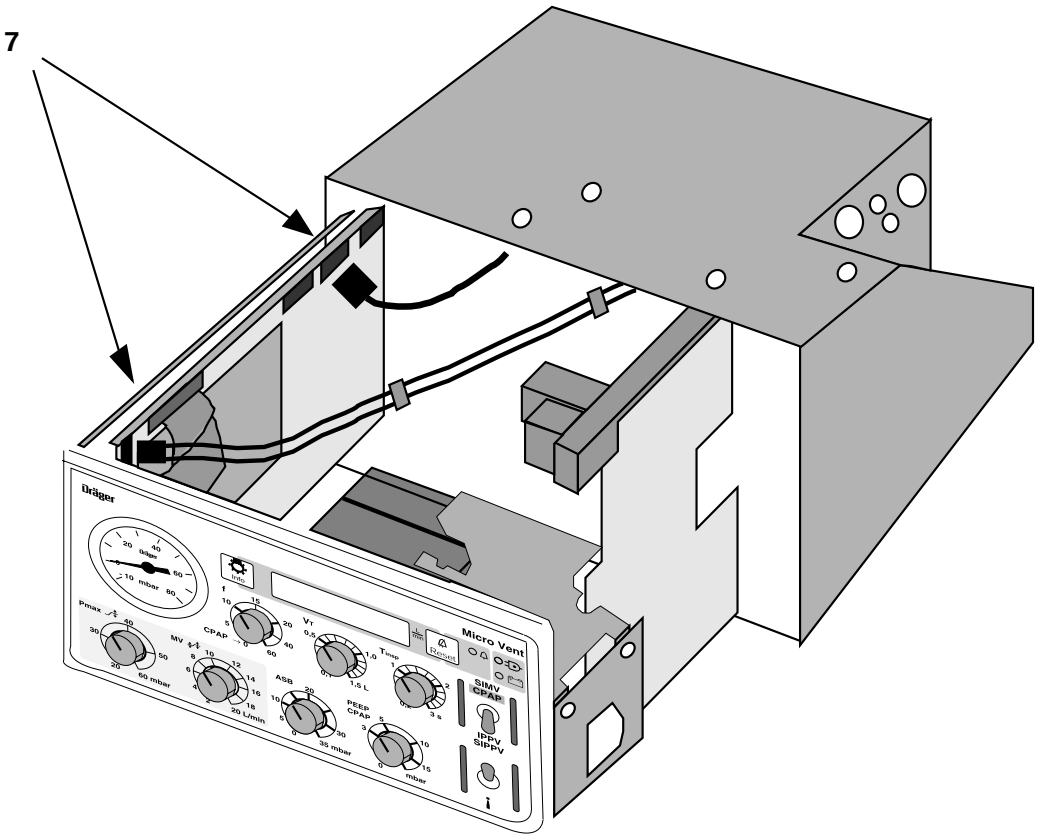
3. Removing the Withdrawable Unit

- Gently pull out the withdrawable unit and disconnect the cable connectors **7**.

Caution:

When pulling out the withdrawable unit make sure not to damage the leads.



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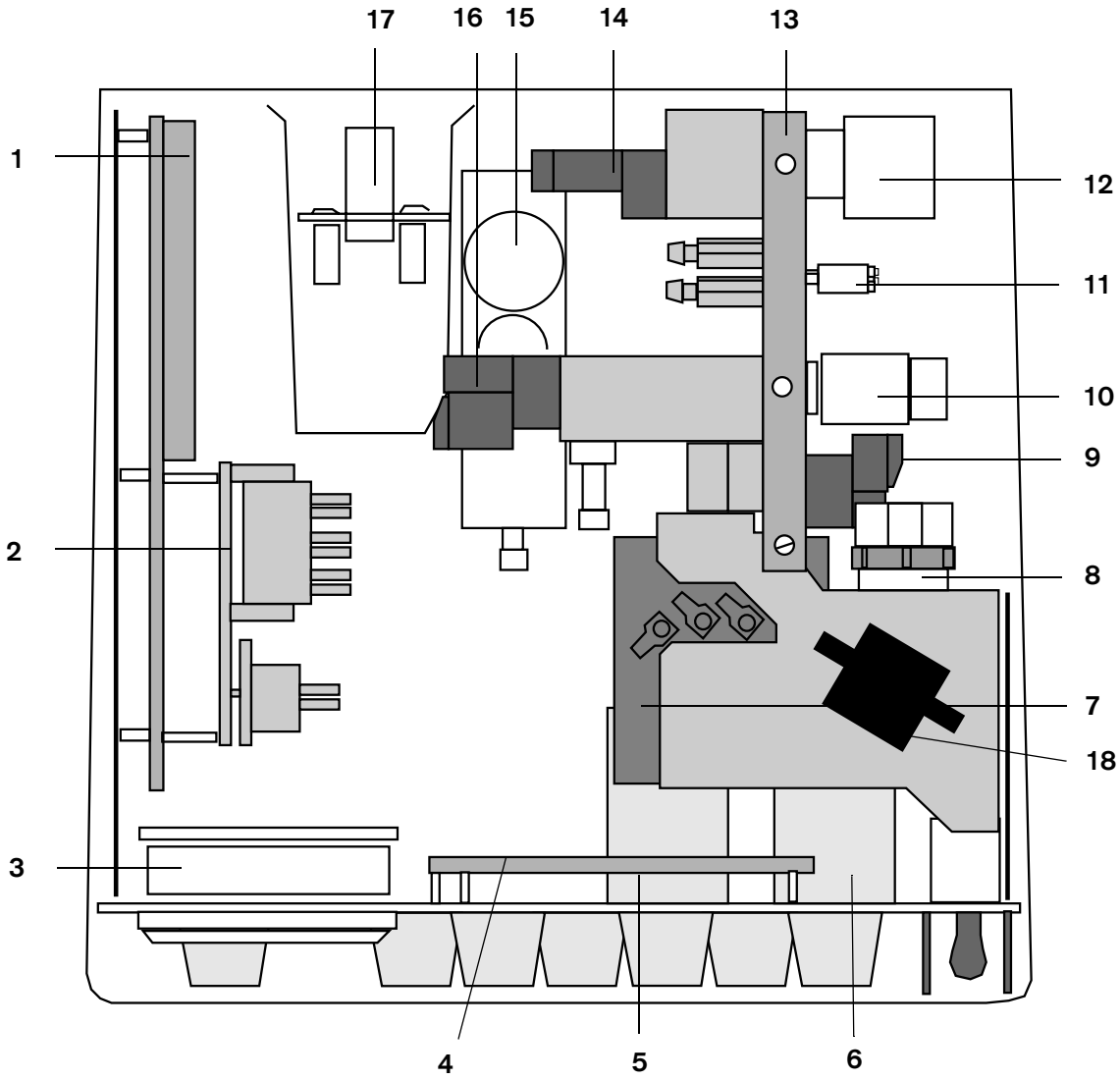
4. Layout of the Pneumatics



Legend

1 Control PCB
2 Sensor PCB
3 Manometer
4 Display PCB
5 ASB valve
6 PEEP valve
7 I:E solenoid valve, PN solenoid valve
8 Pressure regulator
9 Expiratory solenoid valve (from SW-Version 1.21 ASB solenoid valve)
10 Micro Vent wall supply connection
11 Flow sensor connectors
12 Patient outlet
13 Gas inlet
14 ASB solenoid valve (from SW-Version 1.21. Expiratory solenoid valve)
15 MV valve
16 Autozero solenoid valve
17 NiCd or AlkMn battery pack
18 Pressure switch PEEP-ASB (from SW-Version 1.21)

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5. Comparing Software Version 1.10 with Software Versions 1.21 and higher

Software conversions are not being planned for version 1.10 after the conversion to 1.21.

	Software Version 1.10	Software Versions as of 1.21
Serial Numbers	Including **ARLA 0050**	as of **ARLB0001**
PEEP valve	8401280	The linearity of the PEEP valve has been re-worked and equipped with non-loosening adjusting screws. new item number:(**8413808**)
ASB valve		The ASB valve has been reworked and equipped with a non-loosening adjusting screw, and remains compatible with software version 1.10.
Front panel		A new front panel was necessary due to a re-scaling of the PEEP valve.
ASB solenoid valve	**8412999**	The ASB solenoid valve is positioned at the expiration solenoid valve location of software version 1.10. new item number: **8413001**
expiration solenoid valve	**8413001**	The expiration solenoid valve is positioned at the ASB solenoid valve location of software version 1.10. new item number: **8412999**
safety valve for flowmeter		Both safety valves SV2, SV3 are each equipped with a filter, held in place be a spring
ASB function	occurs via check valve RV5, RV6, RV8, RV9; ASB and expiration solenoid valves are switched if the patient triggers the unit.	occurs via push-button switch, which compares the set PEEP and ASB pressures. ASB and expiration solenoid valves are only switched if the conditions ASB>PEEP and Trigger are fulfilled.

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	Software Version 1.10	Software Versions as of 1.21
Service mode	• calibration values: 10,30,50,**60**,70 L/min	• calibration values: 10, **15**, 30, 50, 70 L/min. • re-test 025: select push-button switch PEEP-ASB value
dosage R2	0,5 L/min at 1 bar (**8406810**)	0,7 L/min at 2 bar (**8413919**)
dosages R10 and R11, into the atmosphere	R10, R11 present	R10, R11: not applicable
plate clamps (e.g. Oxylog 2000)	before the clamps are mounted, the unit's plate should be refitted	the plate is standard equipment for the unit

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6. Control PCB

6.1 General Information about the Control PCB

The Control PCB contains the EPROM to be replaced in the event of a software change. This board does not have any serviceable parts. Should an error occur, you must replace the entire board.It may be possible to rectify technical errors 15 and 16 by way of renewed calibration.

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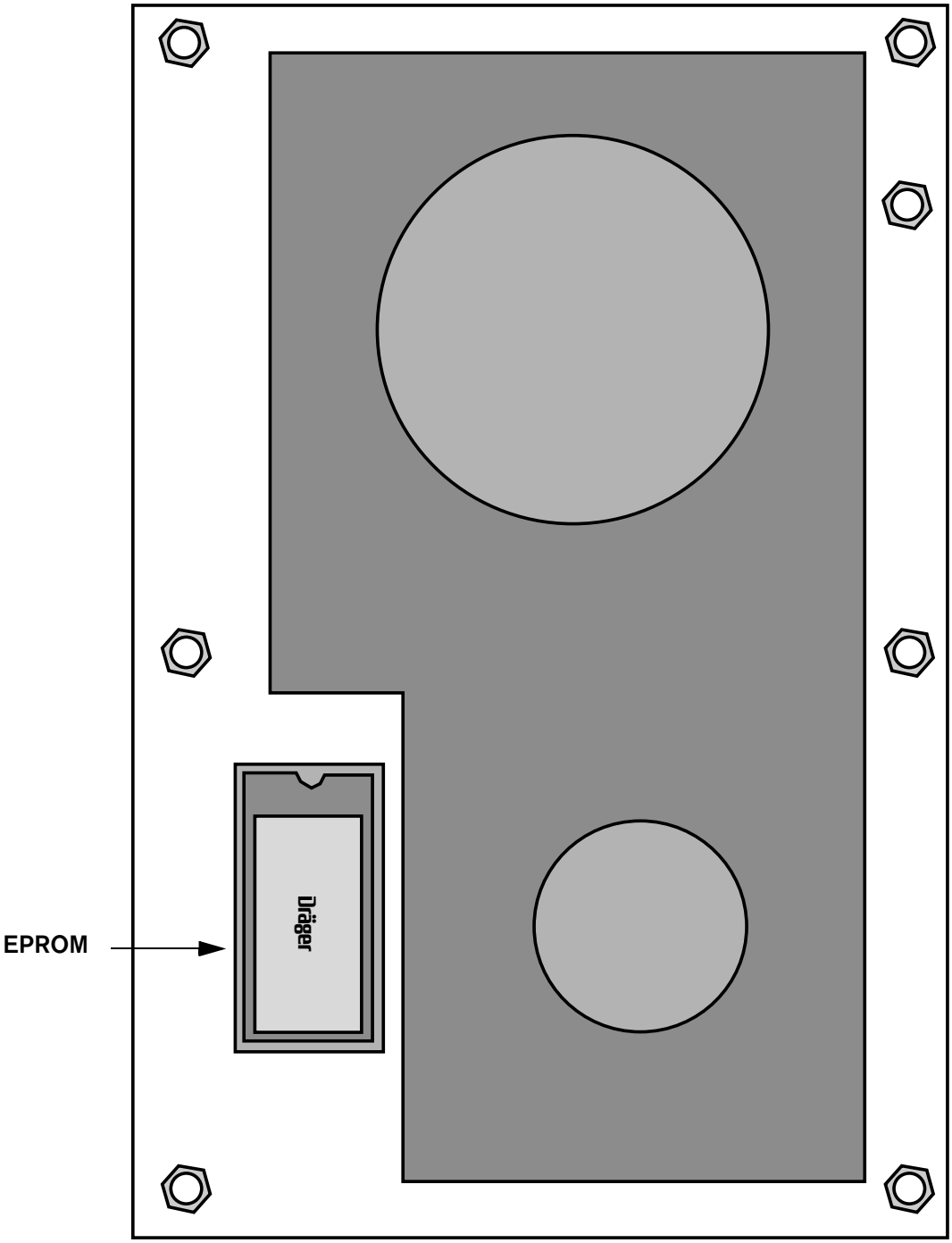
6.2 Control PCB, Soldering Side



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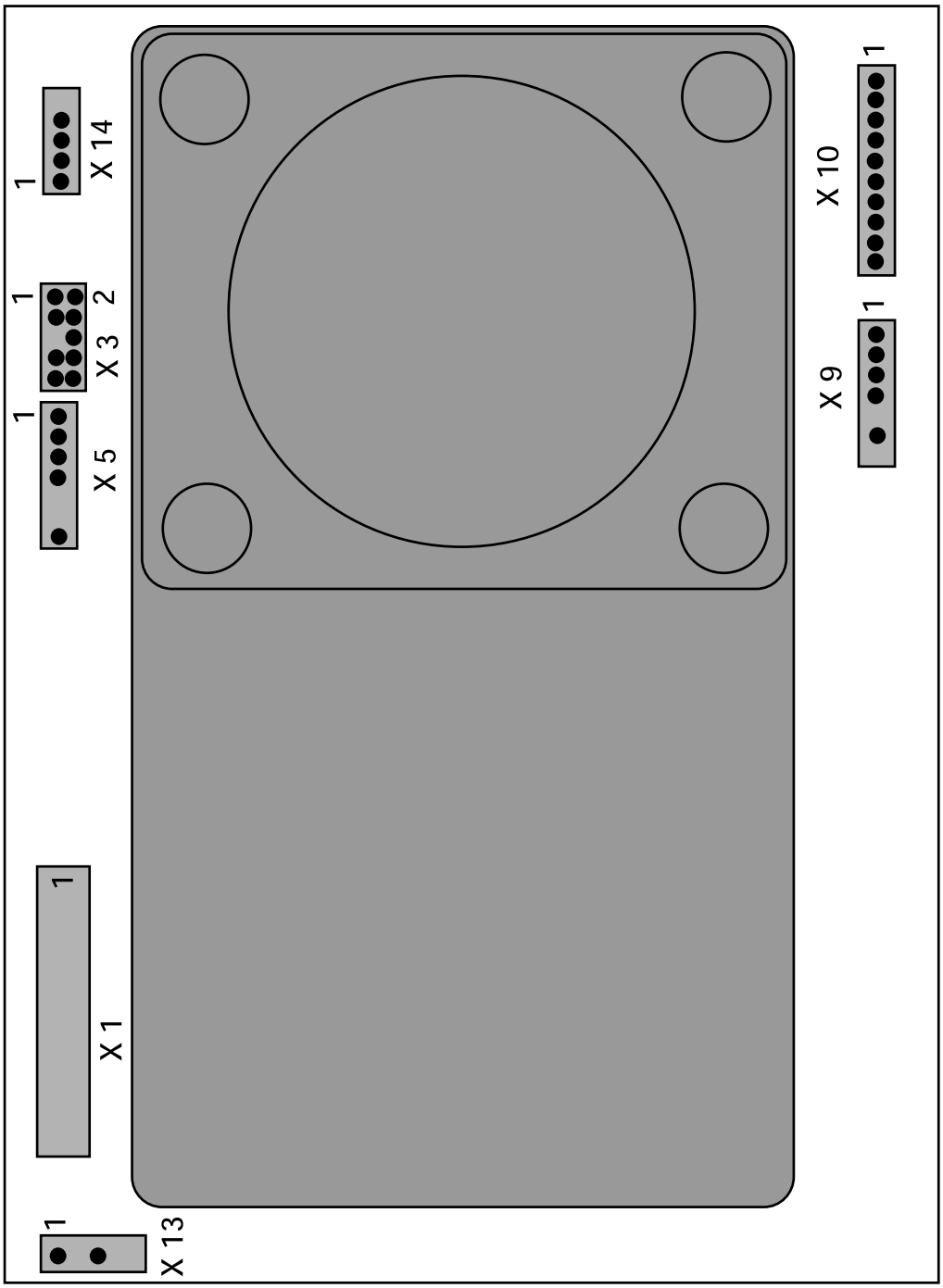
6.3 Control PCB, Component Mounting Side



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6.4 Replacing the EPROM

Caution:

Electrostatic discharge may damage electronic components. Use an ESD protection mat and a wrist strap when handling electronic components.

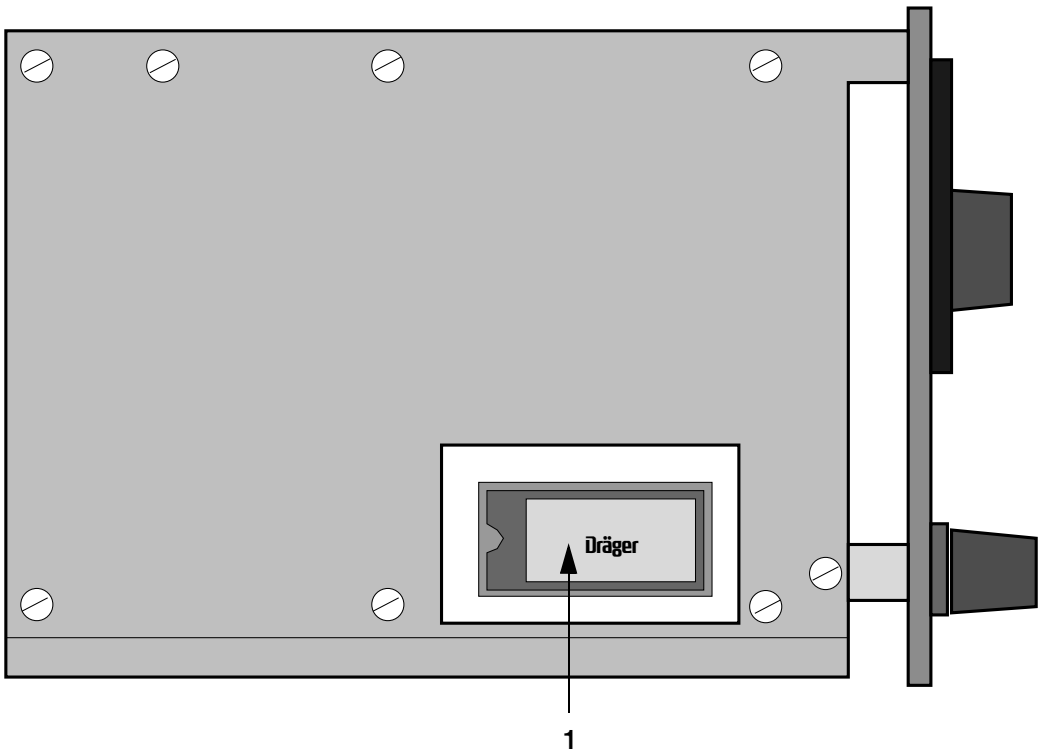
Important:

Make sure to install the EPROM in the correct position.

To replace the EPROM, the MicroVent must be disassembled (see „Opening the MicroVent“).

- Remove the EPROM **1** (on the left side of the device) and replace it by a new one.

MicroVent:
left side view



- Re-assemble the MicroVent.

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6.5 Removing/Replacing the Control PCB

A faulty Control PCB must be replaced completely.

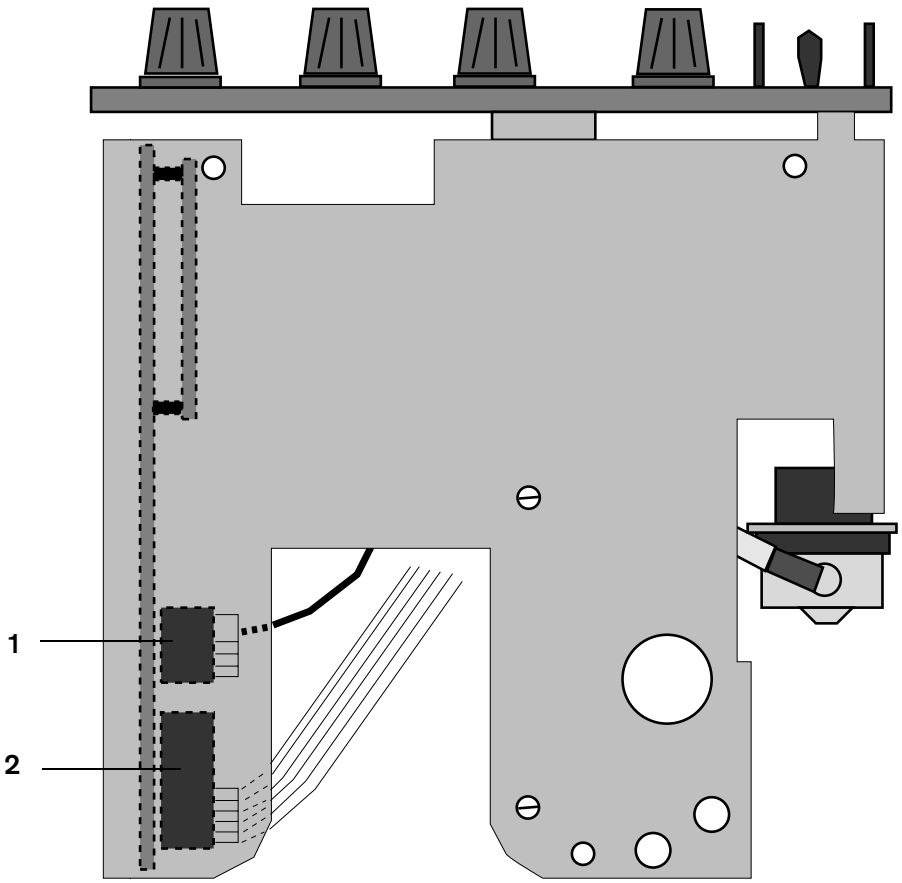
Caution:

Electrostatic discharge may damage electronic components. Use an ESD protection mat and a wrist strap when handling electronic components.

To remove/replace the Control PCB, MicroVent must be disassembled (see "Opening the MicroVent").

- Disconnect the cable connectors **1** and **2** on the bottom.

Bottom view



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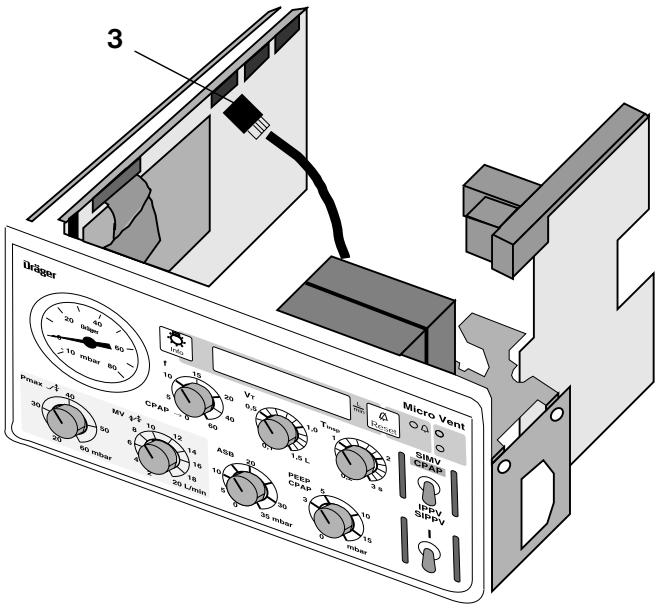
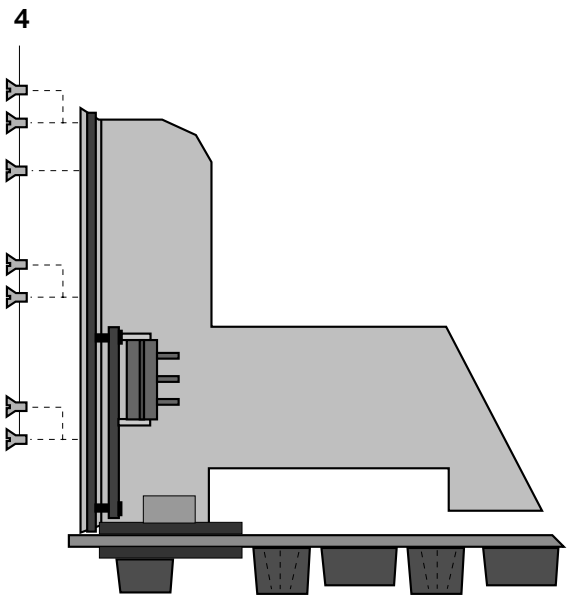
Top view:

- Disconnect the cable connector **3**.



Top view:

- Remove the lateral screws **4**.



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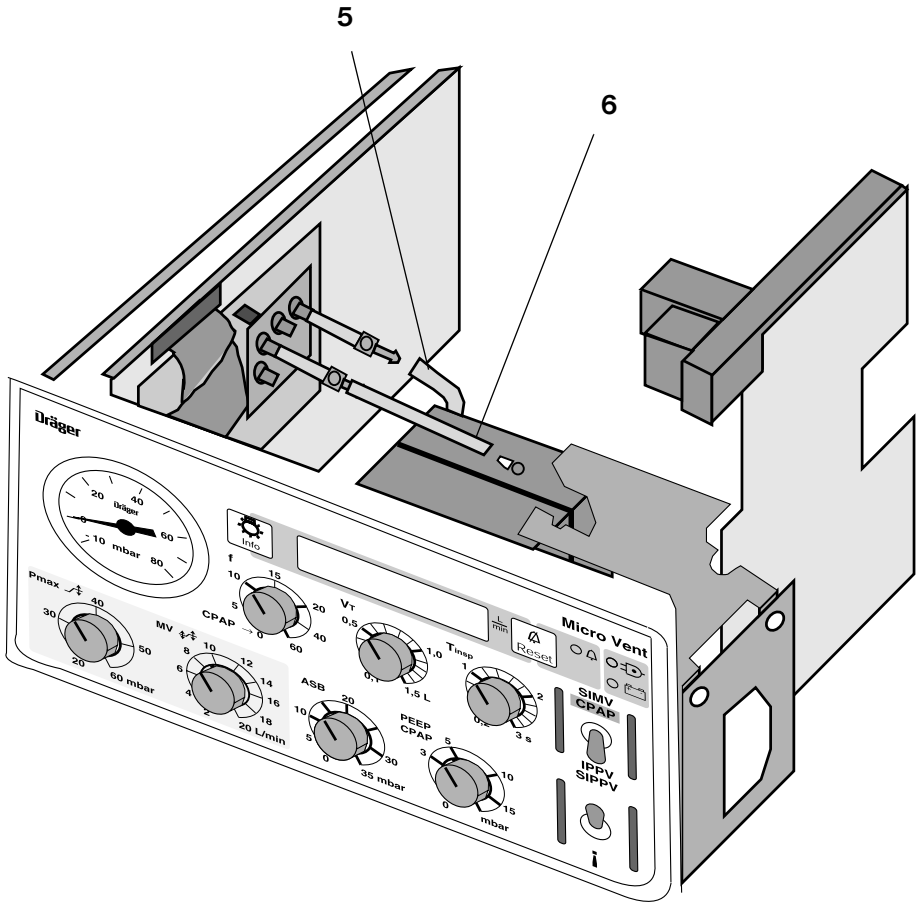
- Disconnect the blue tube to the manometer from the T-piece.
- Disconnect the blue tube to the pneumatics assembly from the T-piece.
- Disconnect the red tube to the copper dosage from the T-piece.
- Disconnect the orange tube to the pressure sensor from the 3/2-way valve.
- Gently disconnect the transparent tubes **5** and **6** (see Figure below).



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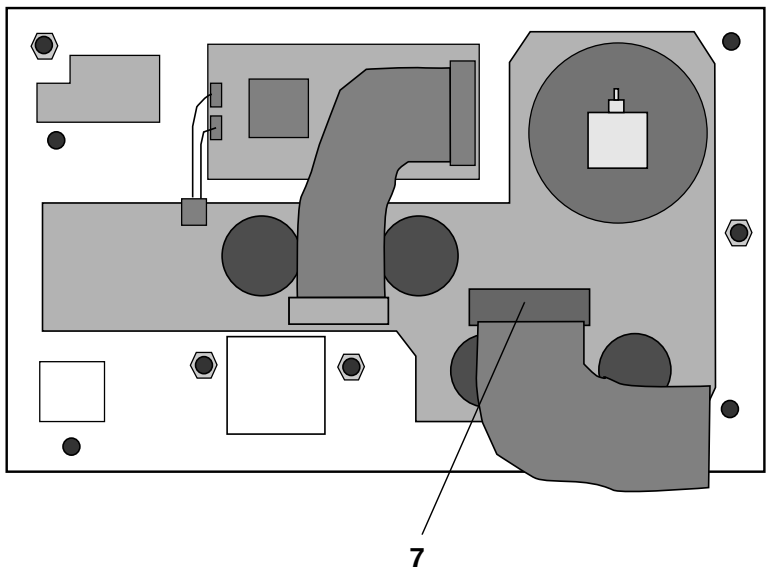
- Pull out the Control PCB slightly and disconnect the cable connector **7** from the front panel.



- Remove the Control PCB.
- Dismount the Sensor PCB from the Control PCB.
- Replace the Control PCB and fix the EPROM on the new Control PCB.
- Remount the Sensor PCB and the Control PCB using the reverse method for dismounting.

Before the first calibration, a new Control PCB will generate the error no. 16. This error will disappear as soon as all values are calibrated (from the Service Mode).

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7. Sensor PCB

7.1 General Information About the Sensor PCB

A faulty Sensor PCB must be replaced with a new board or a repair-exchange board.

7.2 Dismounting/Replacing the Sensor PCB

Caution:

Electrostatic discharge may damage electronic components. Use an ESD protection mat and a wrist strap when handling electronic components.

To dismount/replace the Sensor PCB, the MicroVent must be disassembled (see “Opening the MicroVent”).

The Sensor PCB can only be removed, after removing the Control PCB (see “Removing/Replacing the Control PCB”). The Sensor PCB is secured to the Control PCB by four nuts and retaining rings.

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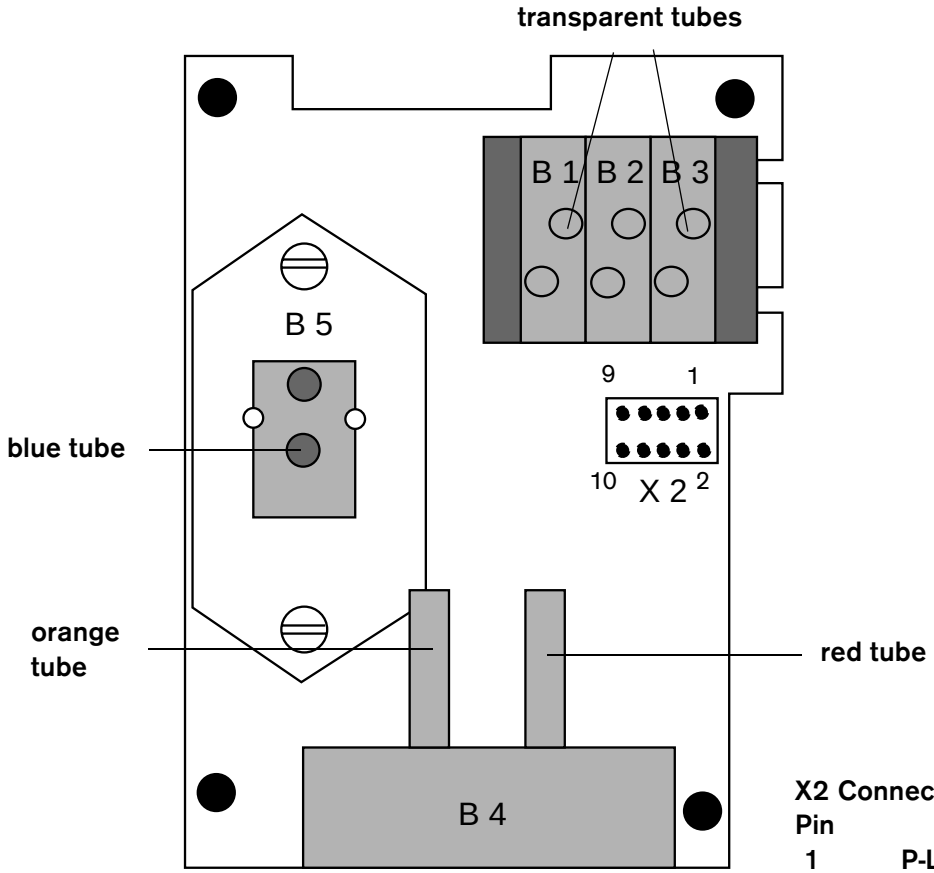

Pressure sensors

B1 P-supply
B2
B3 P-LA
B4 P-flow
B5 P-AW

X2 Connector Pin Assignment

Pin	
1	P-LA
2	VPAW
3	VPSCHALT
4	P-AW
5	DGND
6	AGND
7	P-VERS
8	P-FLOW
9	
10	VPFLOW

Caution:

When replacing the Sensor PCB, make sure not to mix up or damage the tubes.
The tubes at B1 and B3 must be replaced (PAE n f 4 x 1, length: approx. 25 mm).

- Mount the Sensor PCB using the reverse method for dismounting.

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8. Display PCB

8.1 General Information About the Display PCB

A faulty Display PCB must be replaced completely.

8.2 Dismounting/Replacing the Display PCB

Caution:

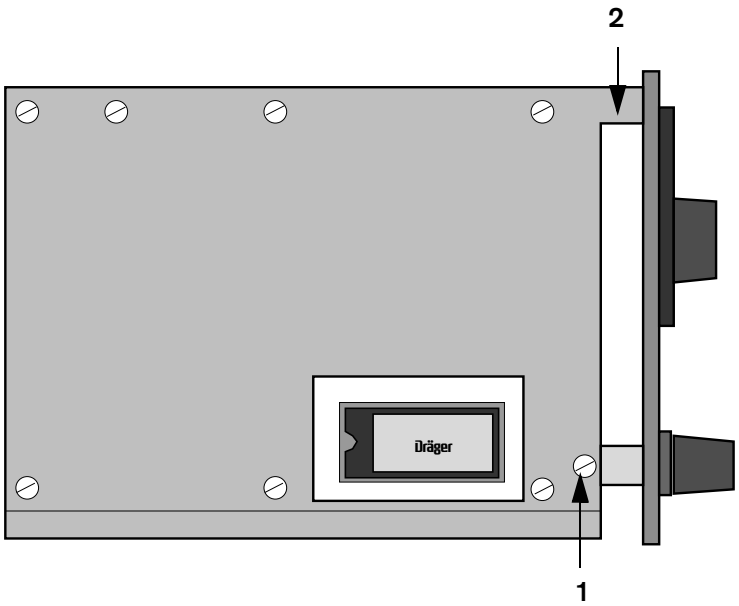
Electrostatic discharge may damage electronic components. Use an ESD protection mat and a wrist strap when handling electronic components.

To dismount/replace the Display PCB, the MicroVent must be disassembled (see “Opening the MicroVent” in the Section “General”).

Dismount the front panel as follows:

- Remove the screw **1** and the nut **2** including the washer of the module mounting plate.

Left side view



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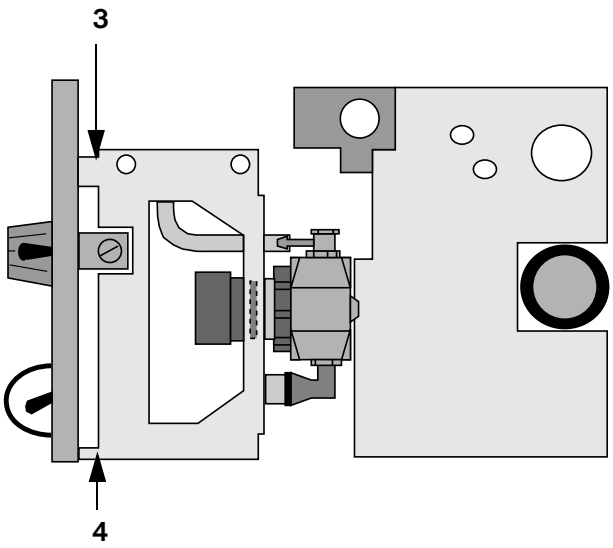
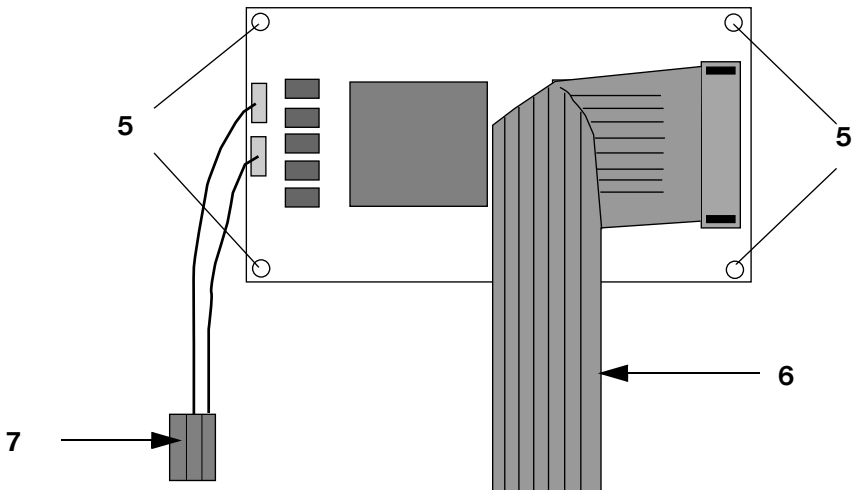
Right side view

- Remove the nuts including the washers **3** and **4** of the module mounting plate (located behind the module mounting plate).



- Pull out the front panel slightly and disconnect the flat cable **6** and the connecting lead **7** from the Front Panel PCB.



- Remove the nuts **5** from the Display PCB.
- Replace the Display PCB.
- Secure the new Display PCB and re-connect the flat cable **6** and the connecting lead **7** into the front panel (when connecting the connecting lead **7**, make sure the pins are in the correct position).
- Mount the Display PCB using the reverse method for dismounting.

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9. Front Panel

9.1 General Information About the Front Panel

A faulty front panel must be replaced completely.

If you order a new front panel you must have a look on the SW-version of the MicroVent, because they have different front panels.

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9.2 Dismounting/Replacing the Front Panel

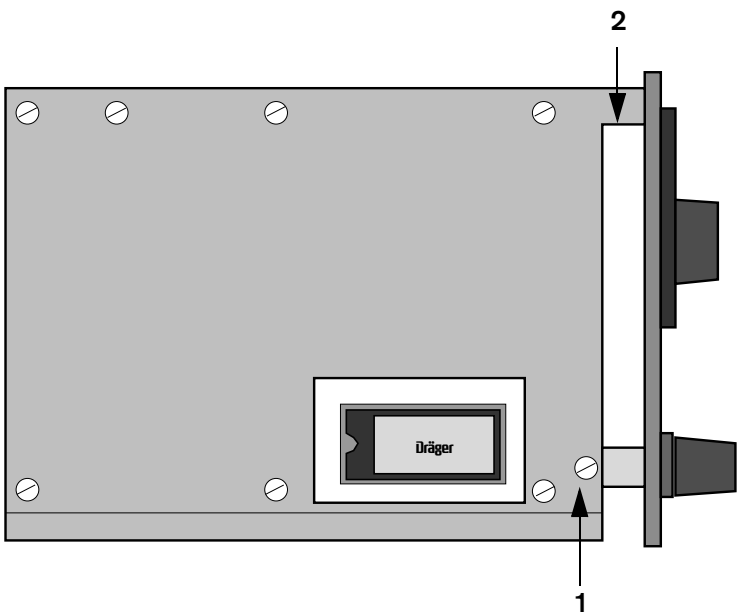
Caution:

Electrostatic discharge may damage electronic components. Use an ESD protection mat and a wrist strap when handling electronic components.

To dismount/replace the front panel, the MicroVent must be disassembled (see "Opening the MicroVent").

- Remove the manometer (see "Dismounting/Replacing the Manometer") and dismount the front panel as follows:
- Remove the screw **1** and the nut **2** including the washer of the module mounting plate (covered by the module mounting plate).

Left side view



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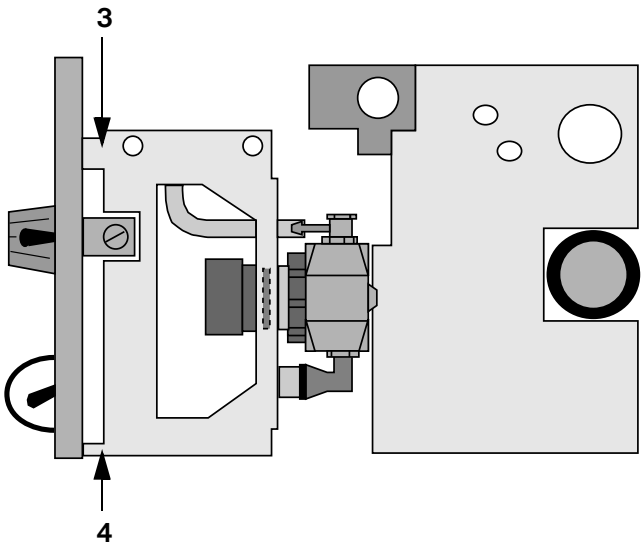
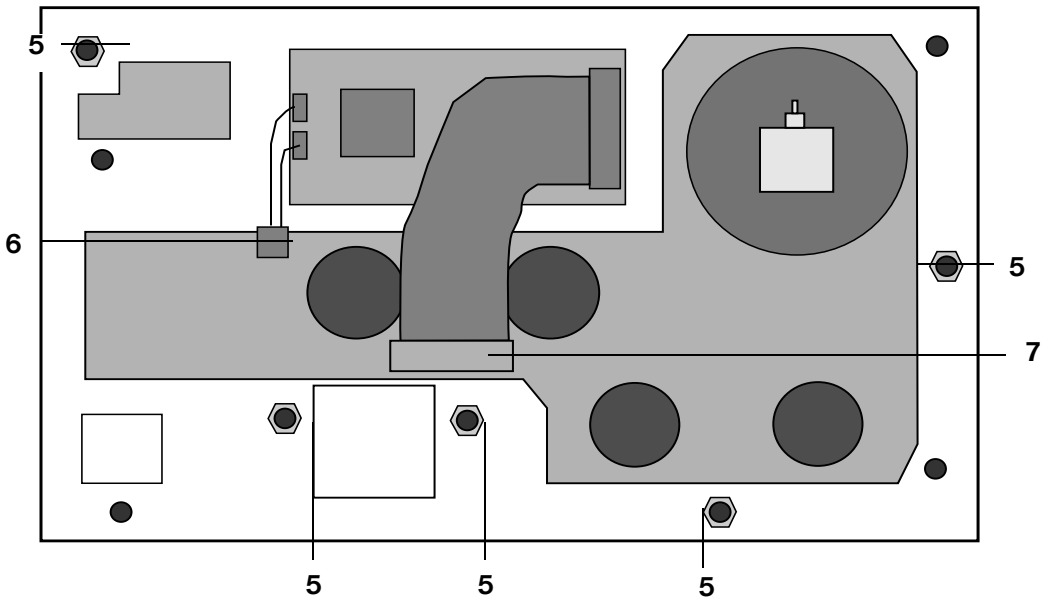
Right side view

- Remove the nuts **3** and **4** including the washers of the module mounting plate (covered by the module mounting plate).



- Disconnect the leads **6** (note down the terminal assignments) and **7** and remove the nuts **5** including the washers.

Rear view of the front panel



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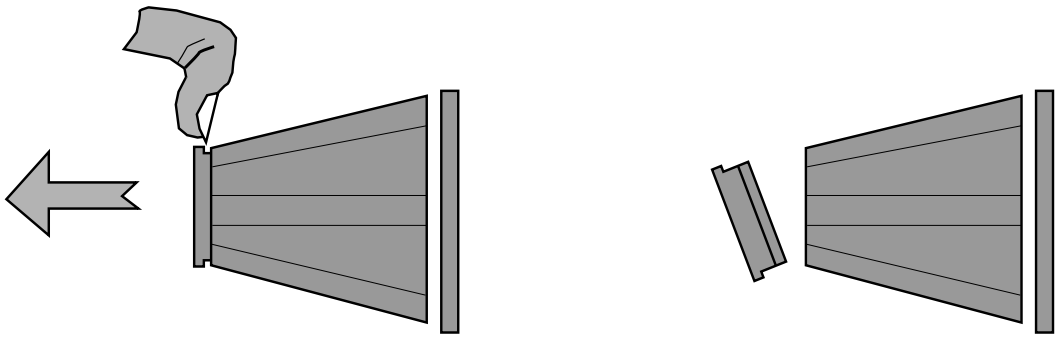
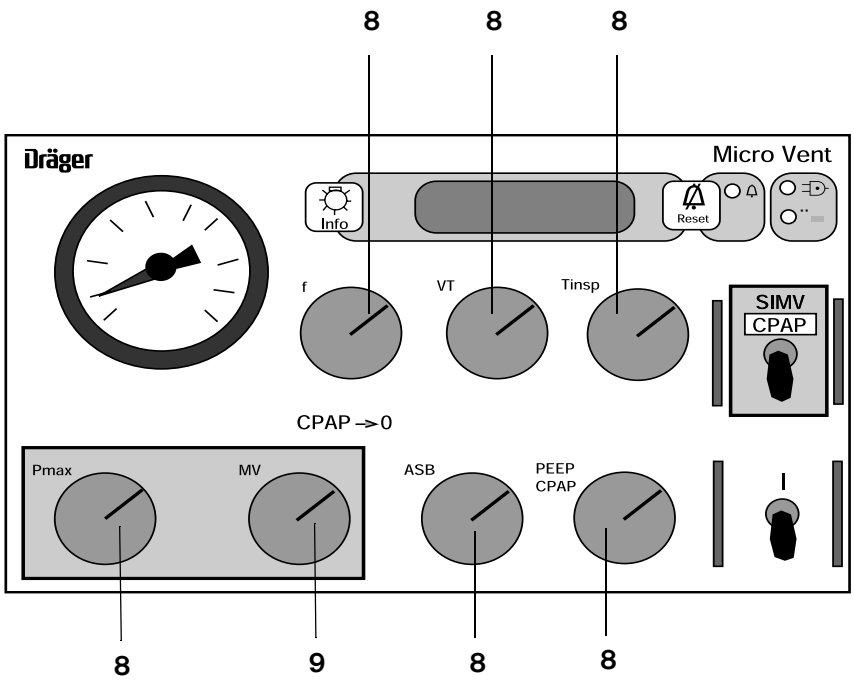
- Remove the front button caps (as shown in the Figure below).
- Loosen the hex socket-heat screws **9** on the MV potentiometer.



- Remove the front buttons **8** from the potentiometer shaft.



- Replace the front panel and mount the Micro Vent using the reverse method for dismounting.

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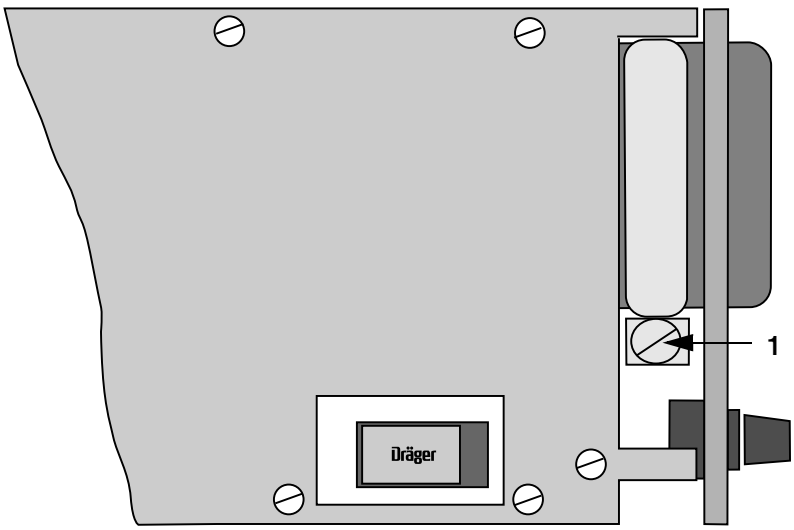
10. Dismounting/Replacing the Manometer

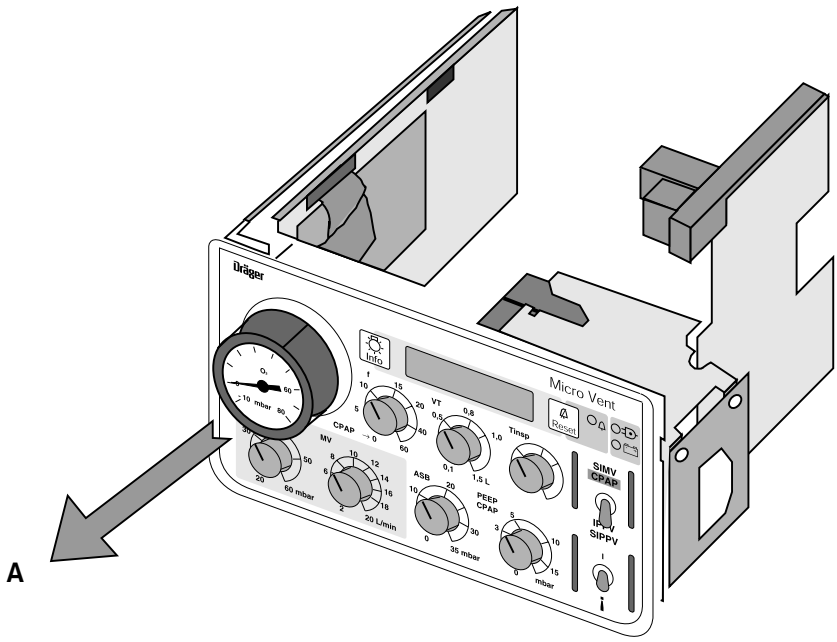
To dismount/replace the manometer, the MicroVent must be disassembled (see “Opening the MicroVent”).

Left side view



- Loosen the screw **1** of the tube clamp.

Right side view



- Remove the manometer by gently pressing it from the inside and sliding it out of the front panel (towards **A**).

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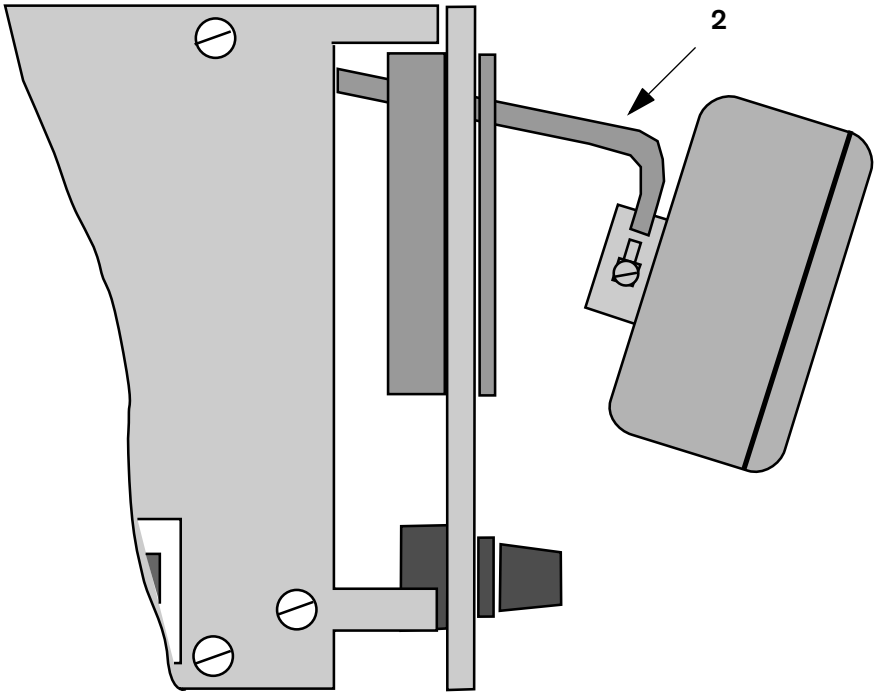
- Disconnect the tube **2** from the manometer.



- Replace the manometer with the new one.
- When fitting the new manometer, make sure the manometer and the sealing are arranged properly.
- Assemble the device using the reverse method for disassembly.
- Check the function of the manometer (functional check).

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11. Pressure Regulator

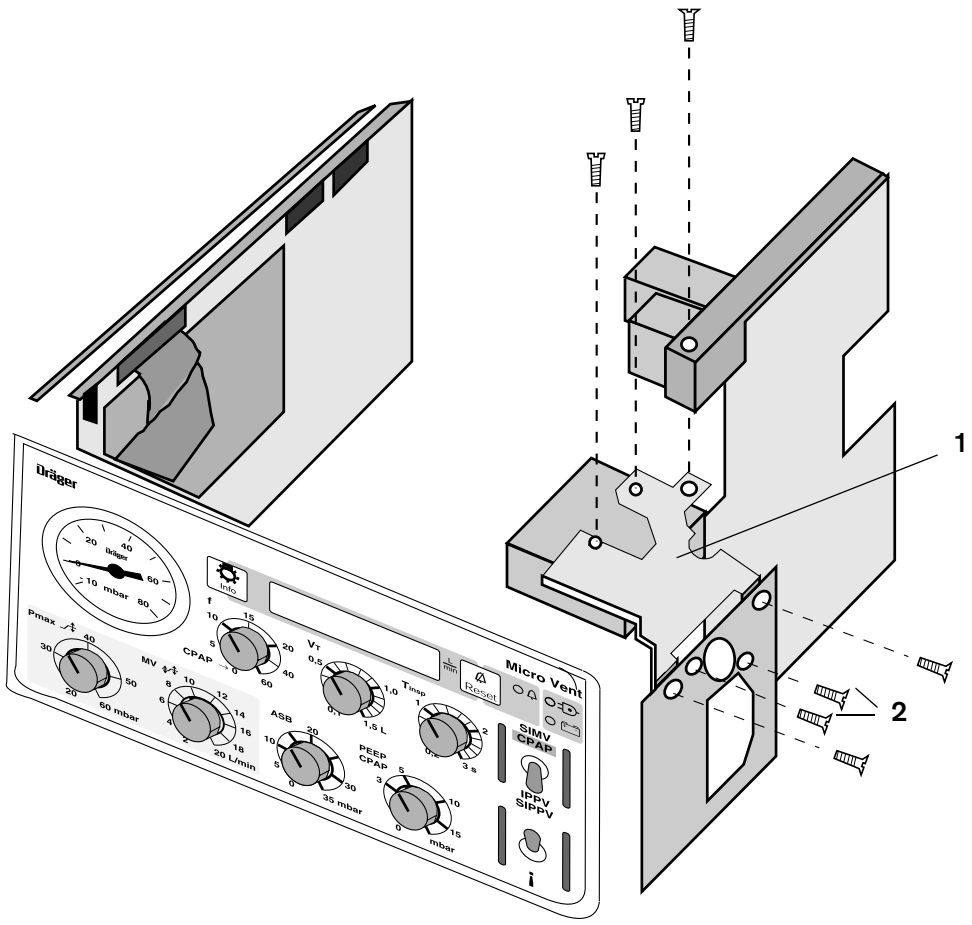
The pressure regulator of the MicroVent must be subjected to a major overhaul after 6 years of service.

11.1 Replacing the Spare Parts Set of the Pressure Regulator

To replace the spare parts set, the MicroVent must be disassembled (see “Opening the MicroVent”).

Dismounting the I:E, P/N Valve Mounting Plate

- Remove the retaining screws from the mounting plate **1** and put the mounting plate aside.
- Remove the retaining screws **2**.



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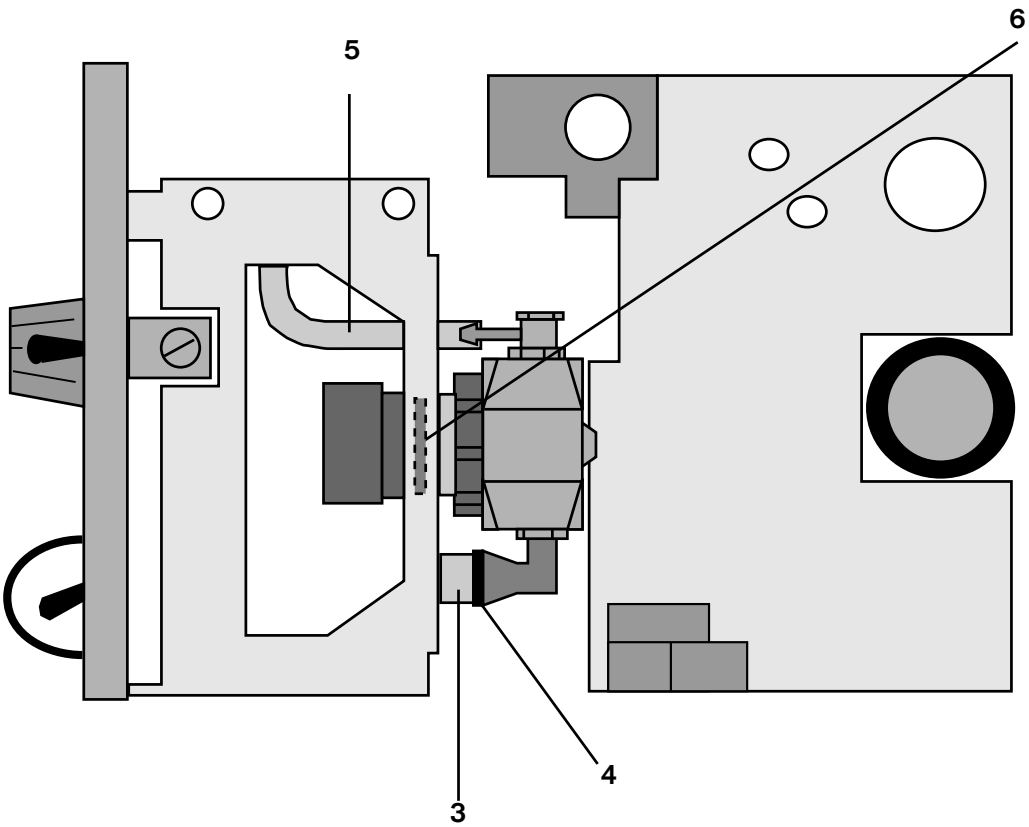
11.2 Dismounting the Pressure Regulator DR 1

- Disconnect the hose **3** by pressing the retaining ring **4**.
- Pull off the hose **5**.

Caution:

When removing the pressure regulator make sure not to damage the hoses.

- Remove the fixing nut **6** of the pressure regulator with a pair of small pliers and remove the pressure regulator.



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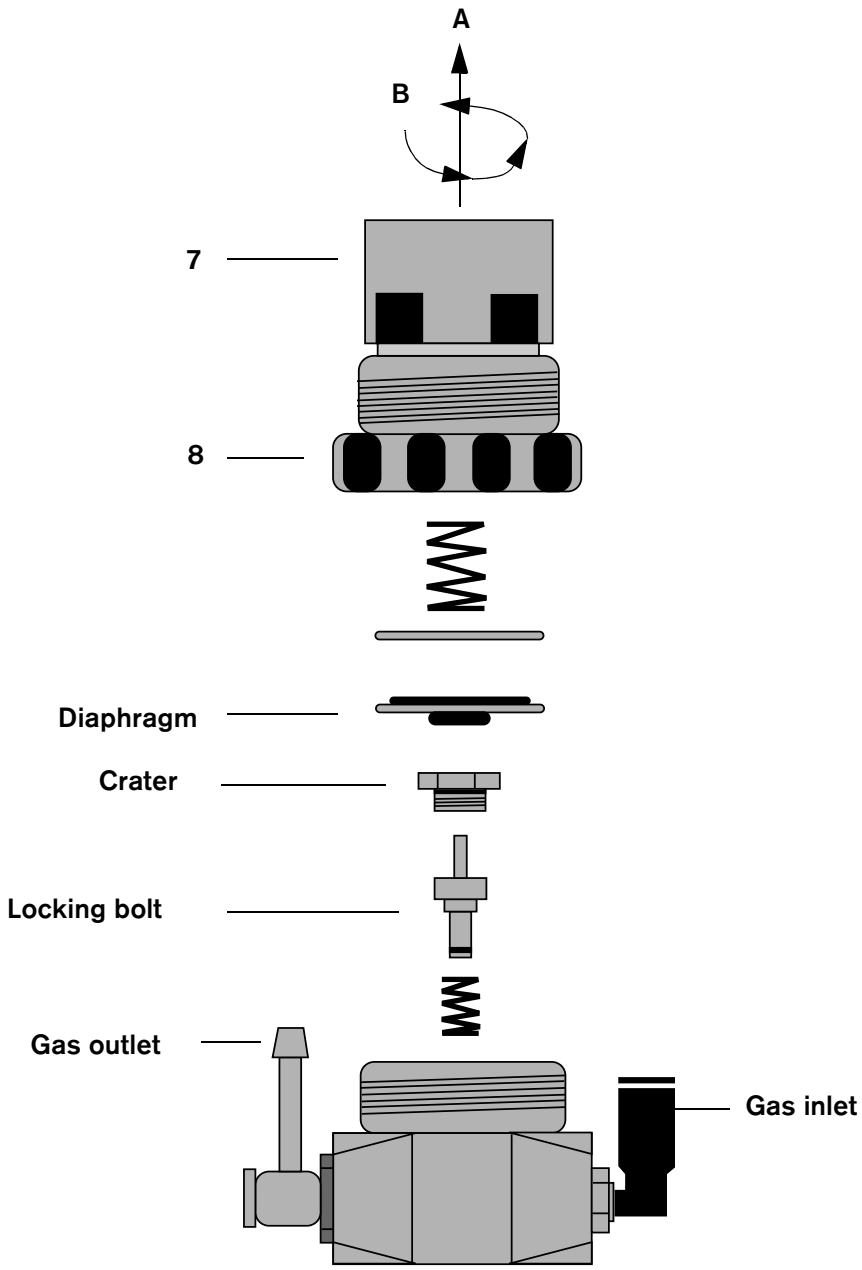
11.3 Pressure Regulator DR 1: Mounting the Spare Parts Set

- Before fitting the new spare parts set, you must close the pressure regulator by unlocking the adjusting ring **7** (pull towards **A**).
- Turn the adjusting ring **7** counterclockwise towards **B** as far as it will go.
- Remove the nut **8**.
- Replace the pressure regulator spare parts set.
- Reassemble the pressure regulator.



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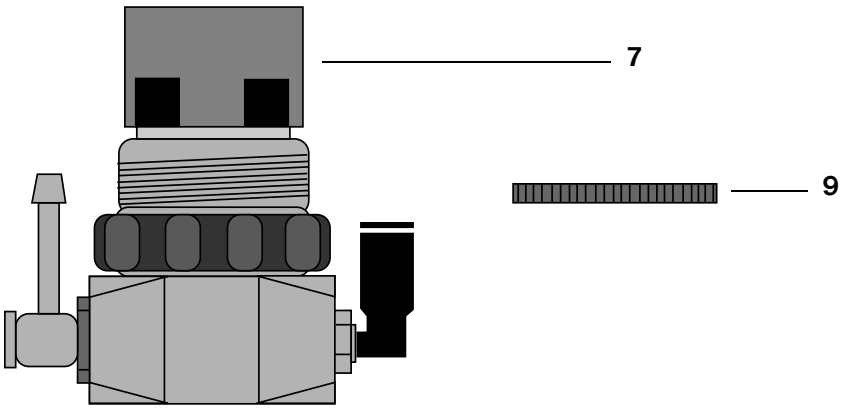
- Mount the pressure regulator including the fixing nut **9**.



11.4 Adjusting the Pressure Regulator DR 1

- Connect the hoses.
- Select Test 021 from the Extented Dräger-Service-Mode.
- Adjust a flow of 40 L/min with the **Reset** key and set the pressure regulator to 1.5 to 1.7 bar .
  (To open the pressure regulator, turn the adjusting ring **7** clockwise.)

The pressure is shown on the bottom line of the display.

- Press the adjusting ring **7** down so that the adjusted value can not be changed unintentionally.
- Assemble the MicroVent using the reverse order of that used for disassembly.

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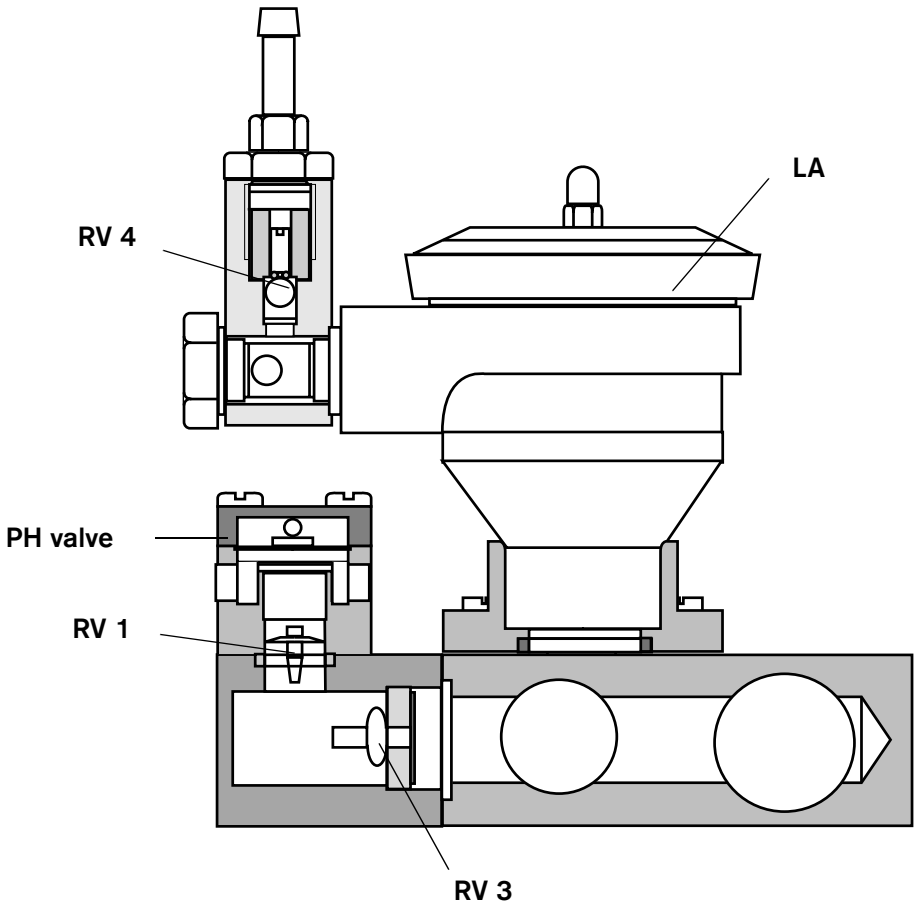
12. Pneumatics Assembly



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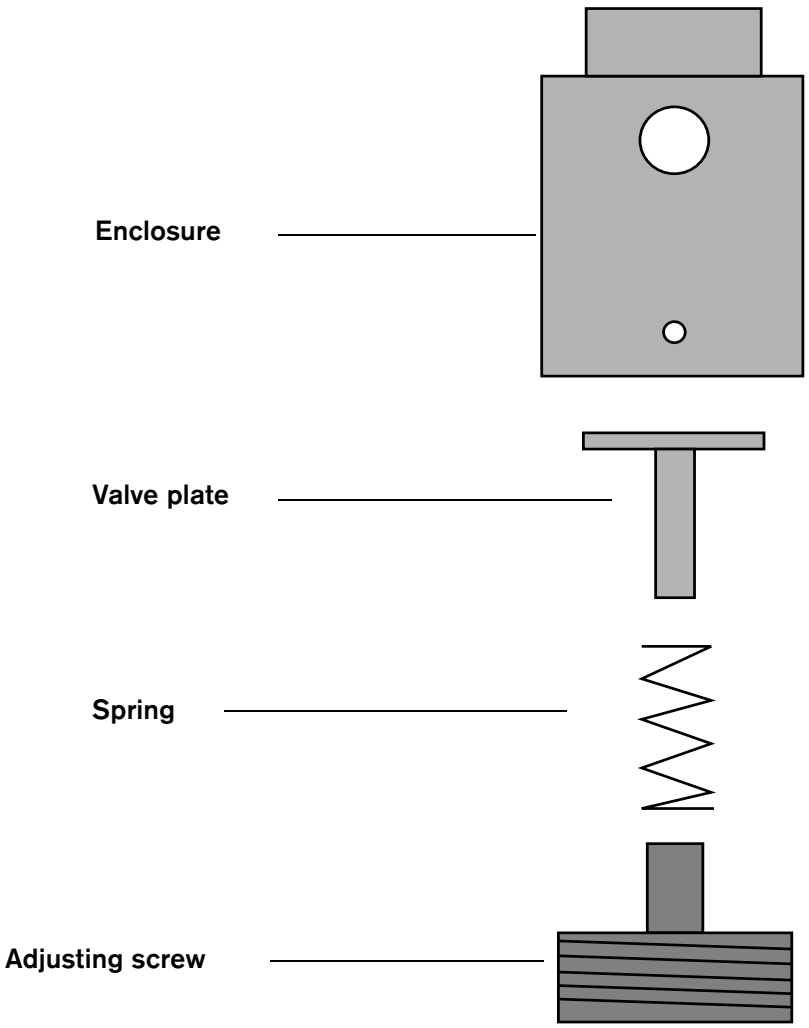
13. Safety Valve

- If the safety valve does not function correctly, adjust it with the adjusting screw.
- If this does not help, clean the safety valve.
- To clean the safety valve unscrew the adjusting screw and remove the spring and the valve plate.

13.1 Adjusting the Safety Valve

- Should the safety valve not vent correctly, adjust it with the adjusting screw.
- Follow the instructions under “Safety Valve” in the Test Certificate.
- After adjusting the safety valve, you must secure the adjusting screw of the safety valve with screw locking agent.



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14. Testing the MV Valve

The MV valve is checked with Tests 022 and 023 from the Extented Dräger-Service-Mode.

14.1 Dismounting/Replacing the MV Valve

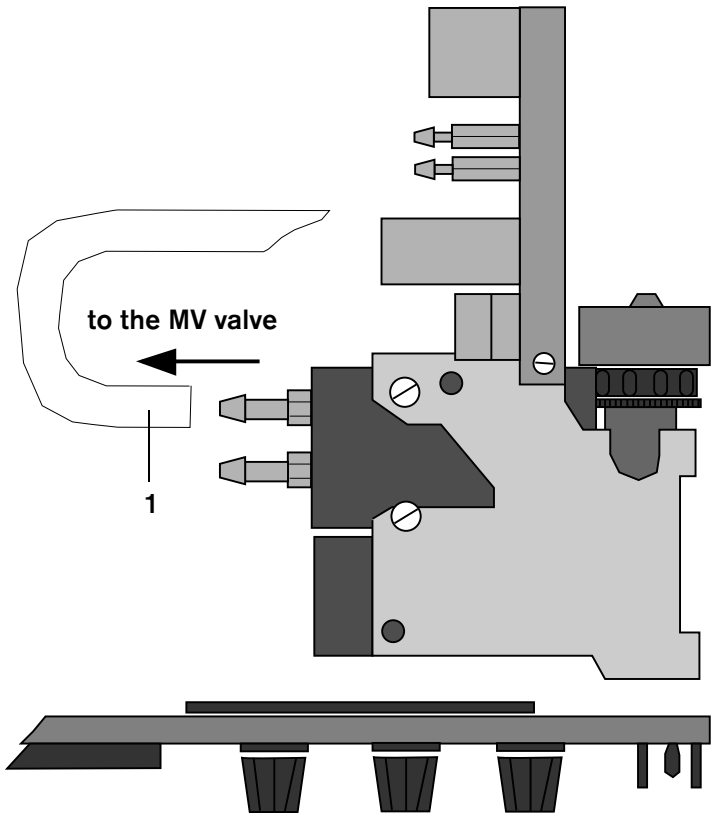
To dismount/replace the MV valve, the MicroVent must be disassembled (see “Opening the MicroVent”).

Caution:

Electrostatic discharge may damage electronic components. Use an ESD protection mat and a wrist strap when handling electronic components.

- Disconnect the tube **1** from I:E valve.

Top view



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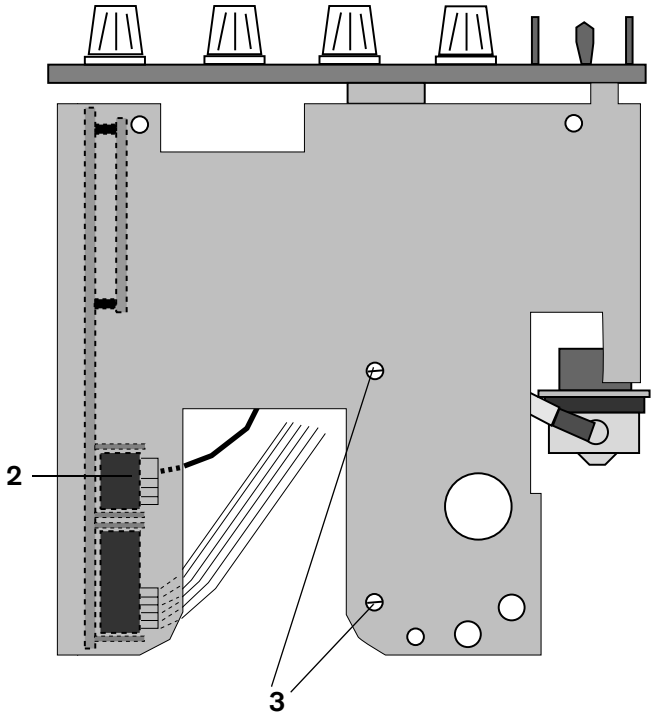
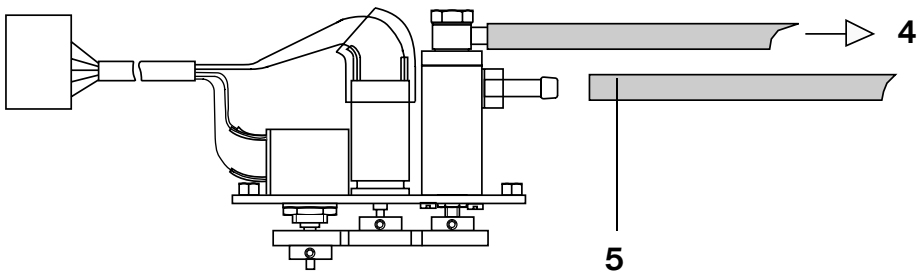
- Disconnect the lead **2**.
- Remove the screws **3**.

Bottom view



- Disconnect the tube **4** from the I:E valve and the tube **5** from the pneumatics assembly.

MV valve



- Replace the MV valve.
- Reassemble the Micro Vent using the reverse order for disassembly.

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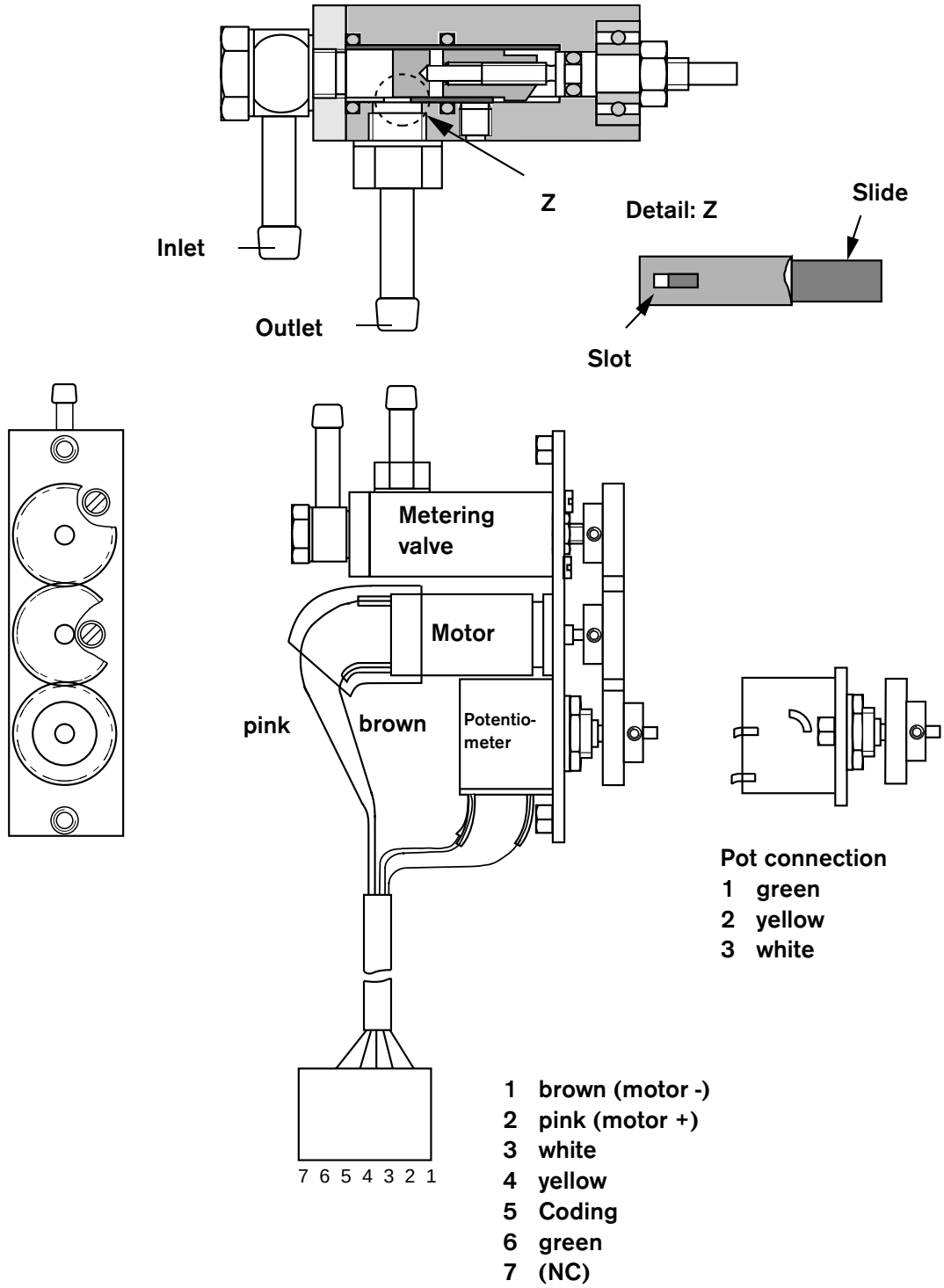
14.2 MV valve



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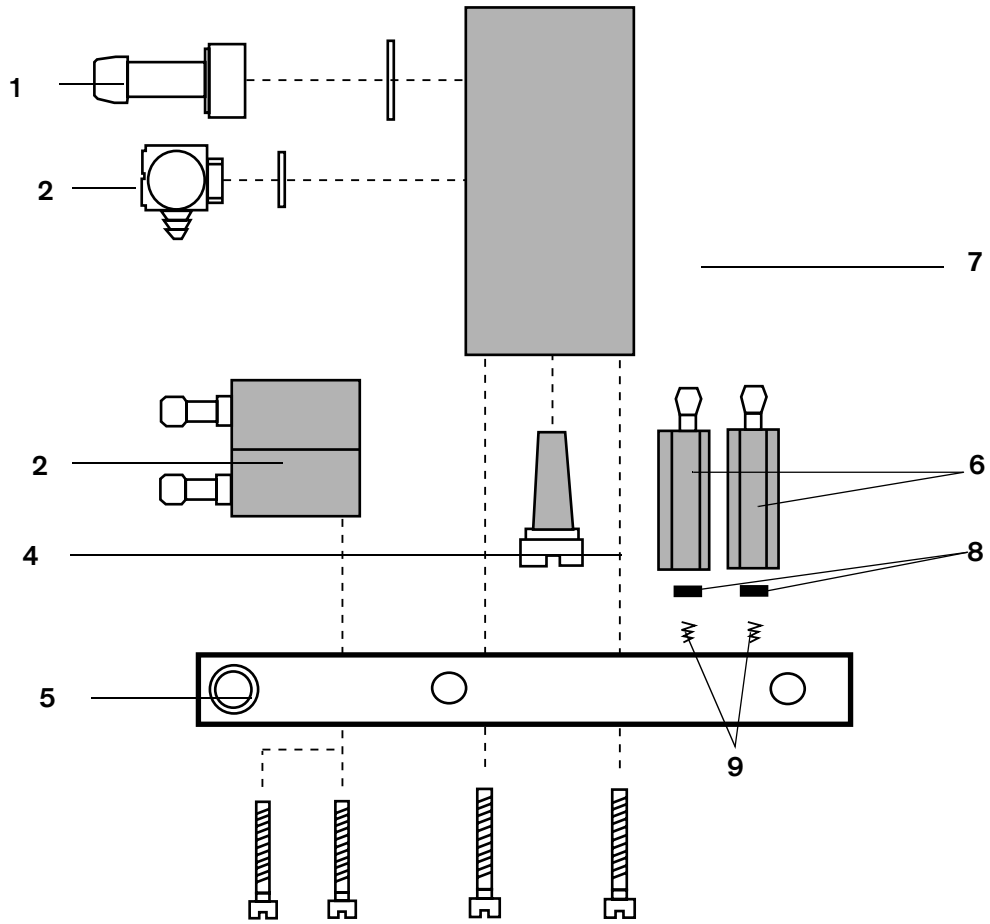
15. Gas Inlet

The gas inlet subassembly consists of the following components:



Legend

1	Gas connection	6	Safety valves
2	R3 restrictor	7	Gas inlet block
3	RV2 valve	8	Sintered filter
4	Filter	9	Spring
5	Connection plate		

Both a sintered filter and a spring are included in software version 1.21 (and higher versions) in front of the safety valves SV2 and SV3. If oder software versions need to be converted, the connection plate should be exchanged, and a sintered filter and spring should be added.

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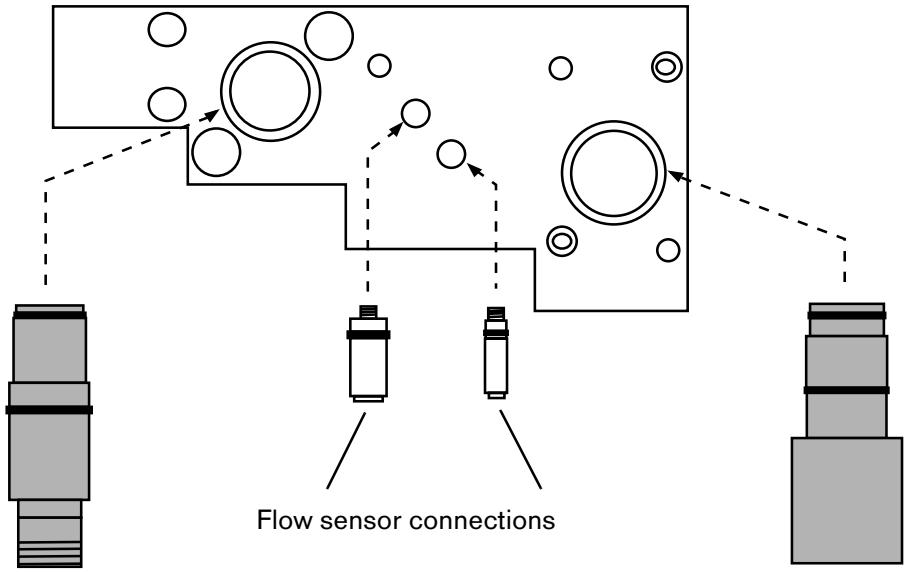
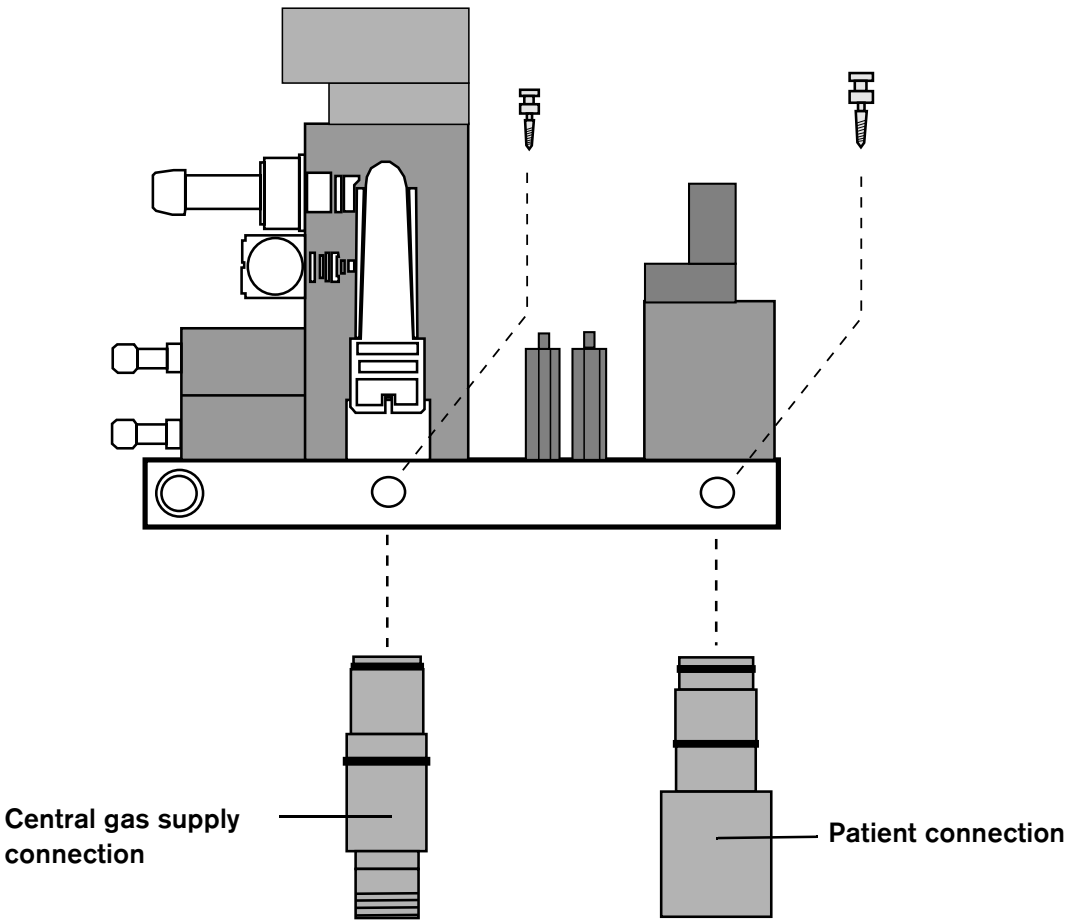
15.1 Overview Gas Inlet



Caution:
Make sure not to interchange the connections.



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16. Autozero Solenoid Valve

16.1 Testing the Autozero Solenoid Valve

The Autozero solenoid valve is checked with Test 016 from the Extended Dräger-Service-Mode (ESM).

16.2 Dismounting/Replacing the Autozero Solenoid Valve

To dismount/replace the Autozero solenoid valve, the MicroVent must be disassembled (see “Opening the MicroVent”).

Caution:

Electrostatic discharge may damage electronic components. Use an ESD protection mat and a wrist strap when handling electronic components.

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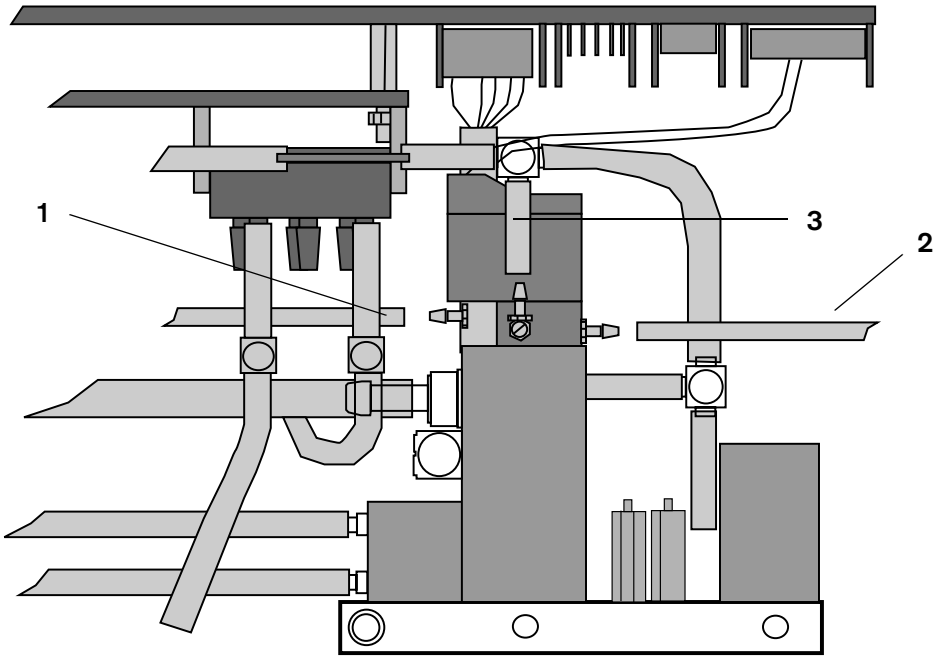
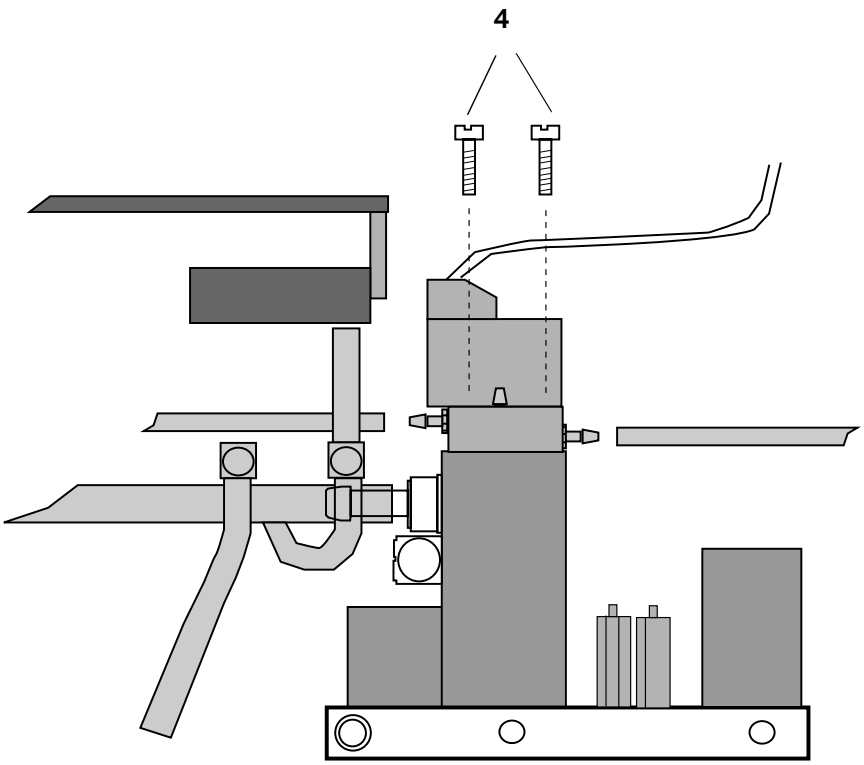
- Disconnect the hoses **1**, **2** and **3**.
- Remove the screws **4**.

Top view





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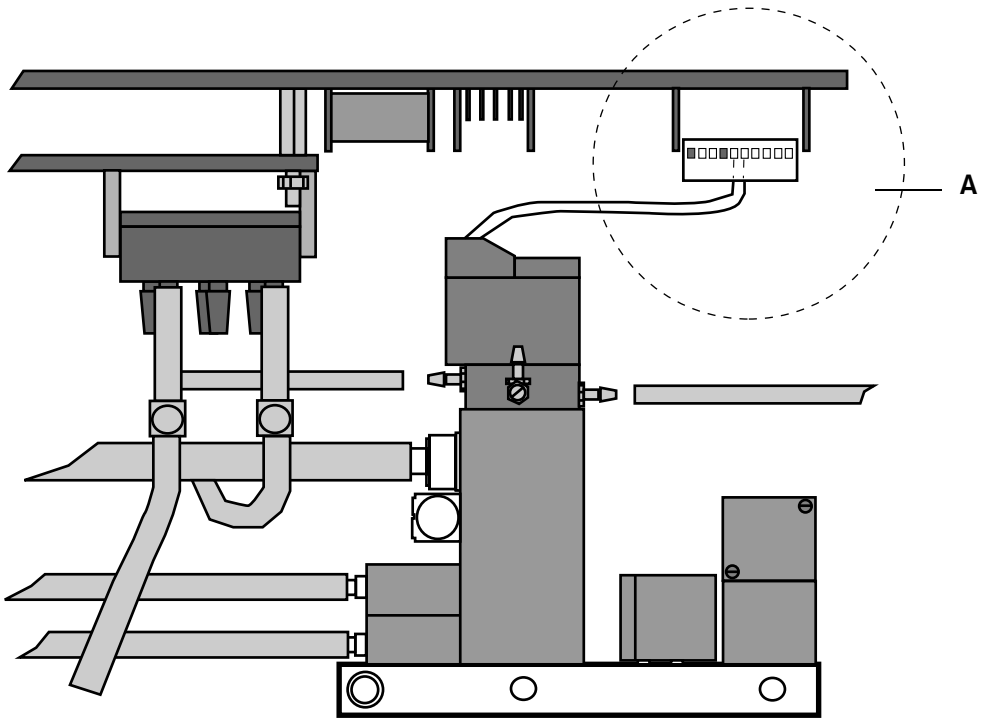
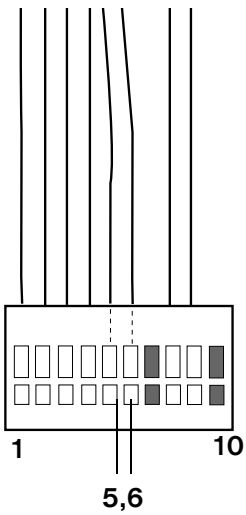
- Disconnect the cable plug-in connector **A** at the bottom of the Control PCB.

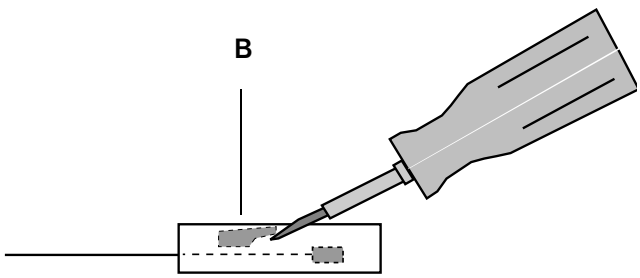
Top view



- Carefully lift the latch tabs **B** with a small screwdriver.
- Pull out the leads with pins **5** and **6** from the jack.



5 black
6 red



- Replace the Autozero solenoid valve and reassemble the MicroVent using the reverse order for disassembly.

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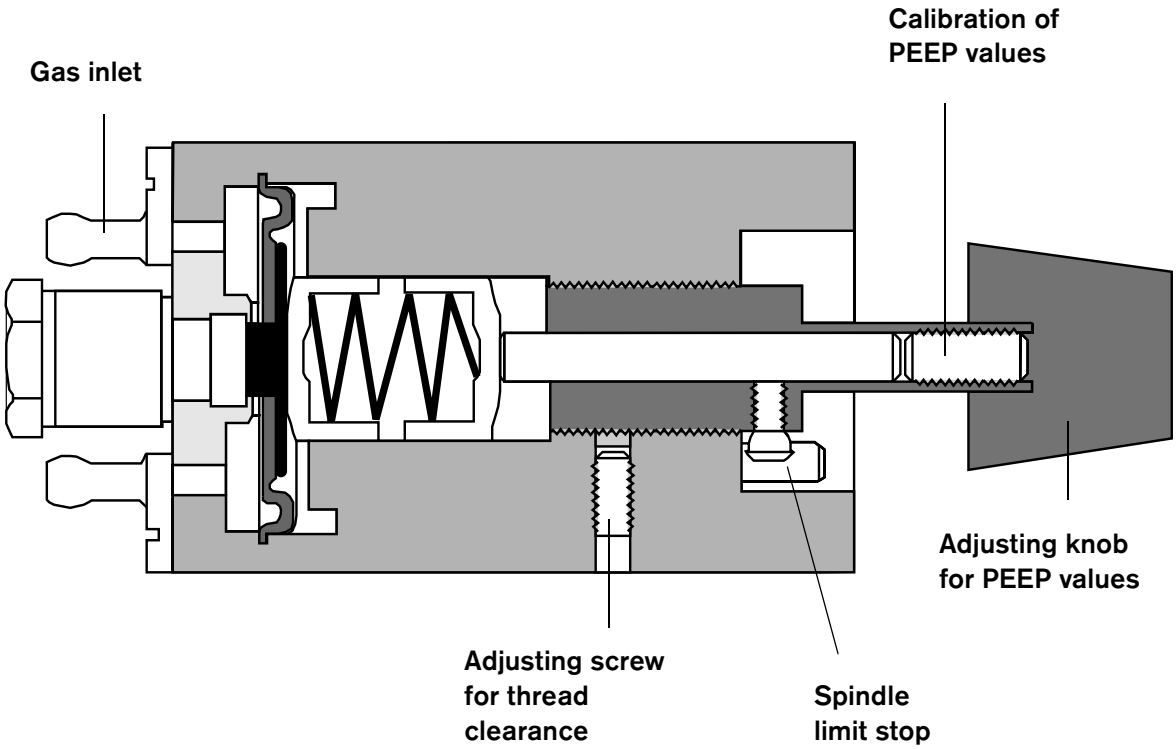
17. PEEP-valve



The PEEP valve in the MicroVent with SW-version 1.10 ist not compatible to the PEEP valve in the MicroVent with SW-version 1.21.

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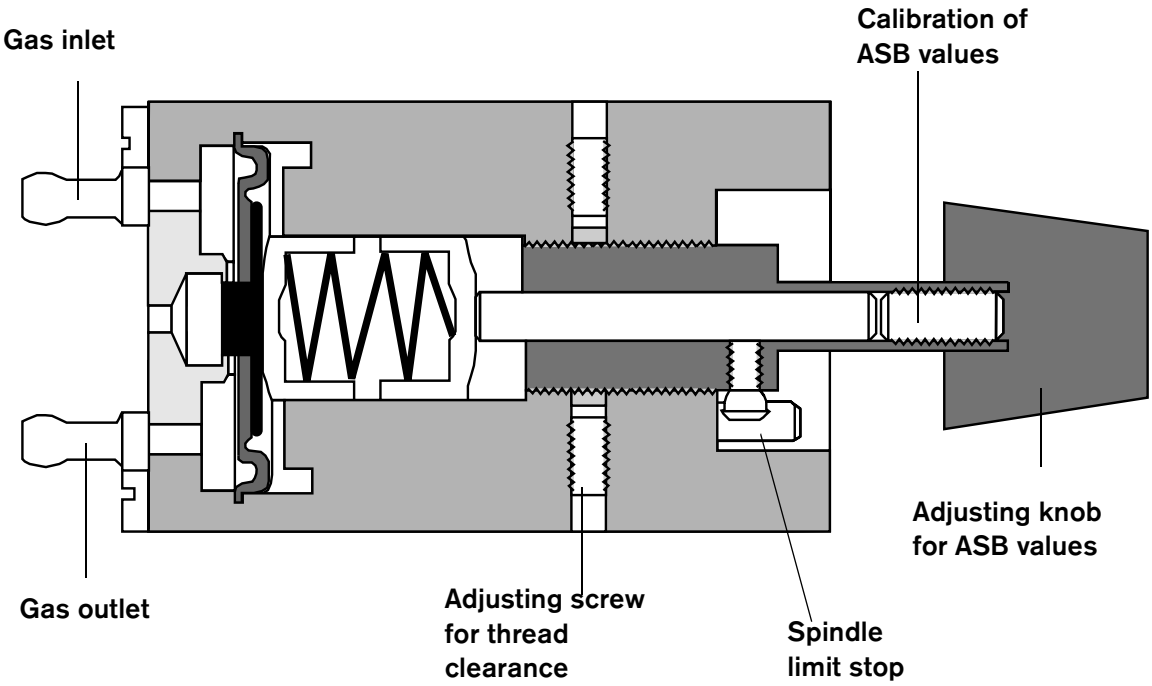
18. ASB valve



An expiration solenoid valve has taken the place of the ASB solenoid valve in software version 1.21 (and all higher versions). The valves differ only in that they have different gas connections.

18.1 Testing the ASB Solenoid Valve

The ASB solenoid valve is checked with Test 020 from the Extended Dräger-Service-Mode (ESM).

18.2 Dismounting/Replacing the ASB Solenoid Valve

To dismount/replace the ASB solenoid valve, the MicroVent must be disassembled (see “Opening the MicroVent”).

Caution:

Electrostatic discharge may damage electronic components. Use an ESD protection mat and a wrist strap when handling electronic components.

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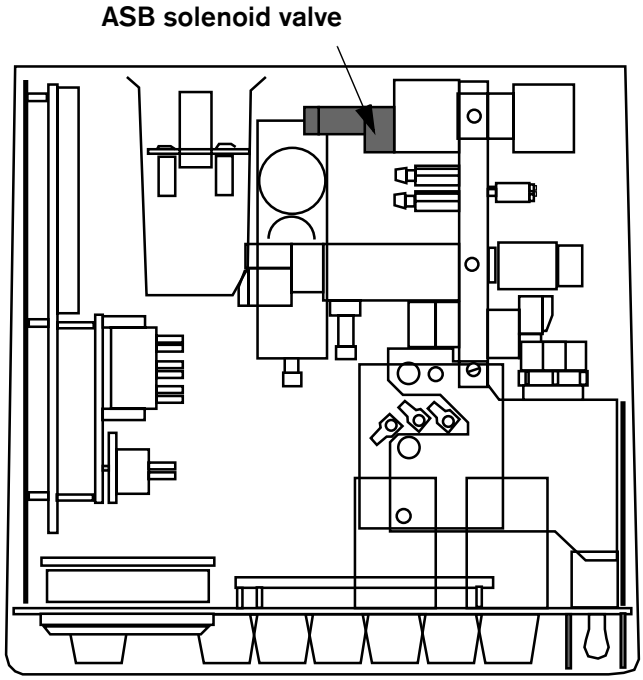
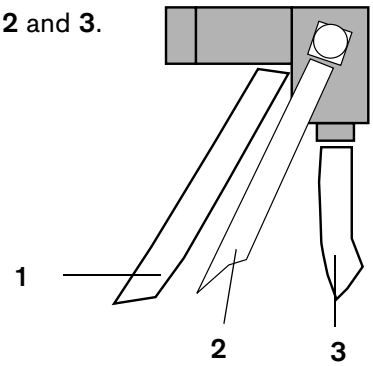
Top view



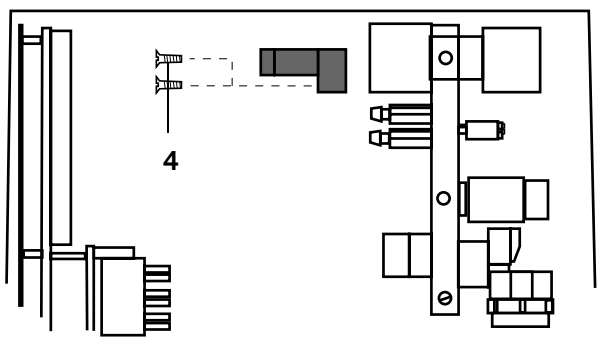
- Disconnect the hoses **1**, **2** and **3**.



1 from RV 2
2 from RV 5
3 from RV 6

Top view

- Remove the screws **4**.



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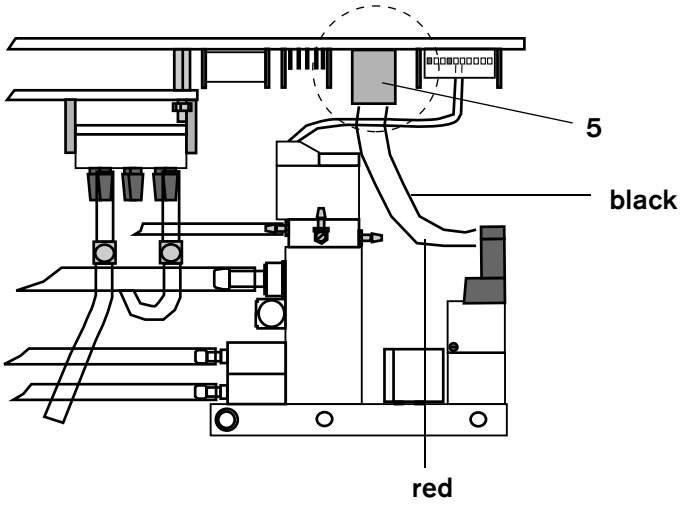
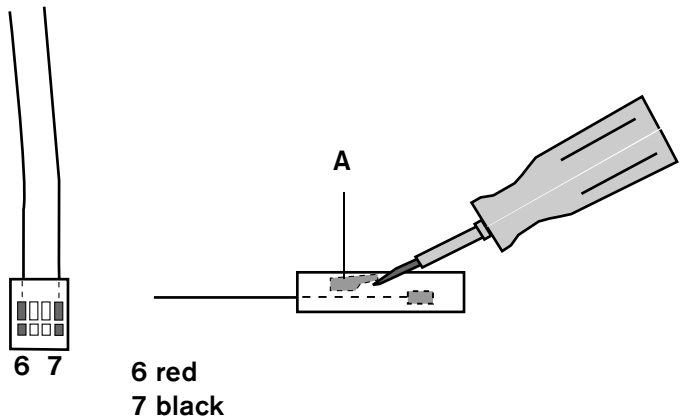
- Disconnect the cable plug-in connector **5** at the bottom of the Control PCB.

Top view



- Carefully lift the latch tabs **A** with a small screwdriver.
- Pull out the leads with the pins **6** and **7** from the jack.



- Replace the ASB solenoid valve (when connecting the connecting lead **5**, make sure the pins are in the correct position) and reassemble the MicroVent using the reverse order for disassembly.

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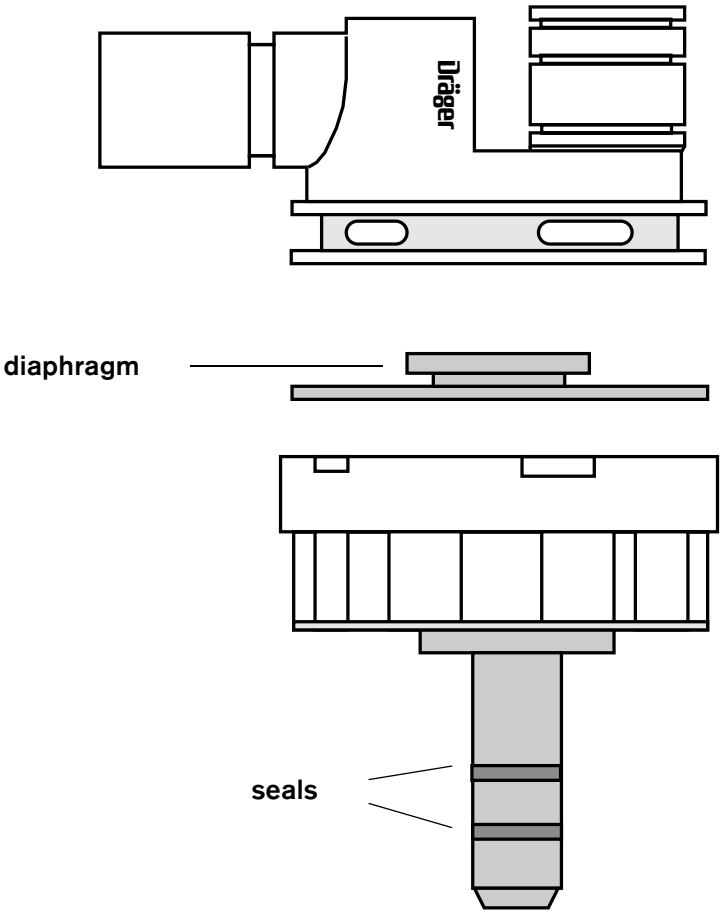
19. Expiratory valve



A ASB solenoid valve has taken the place of the expiration solenoid valve in software version 1.21 (and all higher versions). The valves differ only in that they have different gas connections.

19.1 Testing the Expiratory Solenoid Valve

The Expiratory solenoid valve is checked with Test 019 from the Extended Dräger-Service-Mode (ESM).

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19.2 Dismounting/Replacing the Expiratory Solenoid Valve

To dismount/replace the Expiratory solenoid valve, the MicroVent must be disassembled (see “Opening the MicroVent”).

Caution:

Electrostatic discharge may damage electronic components. Use an ESD protection mat and a wrist strap when handling electronic components.

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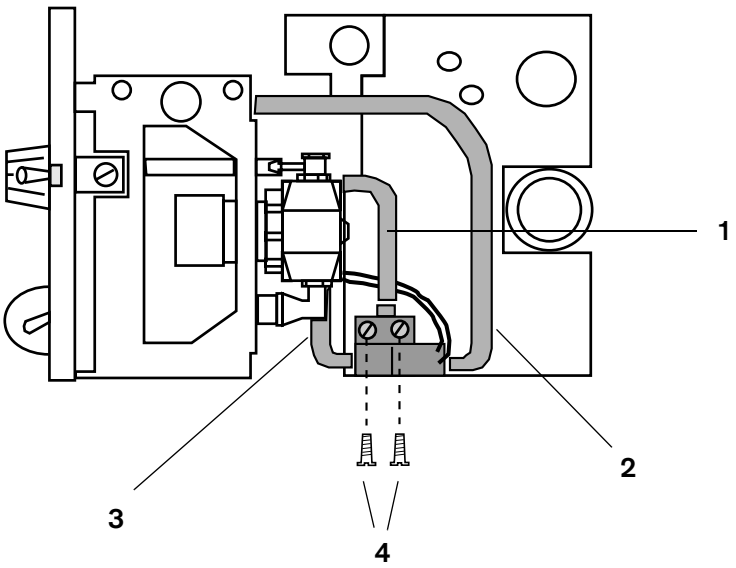
- Disconnect the hoses **1**, **2** and **3**.
- Remove the screws **4**.

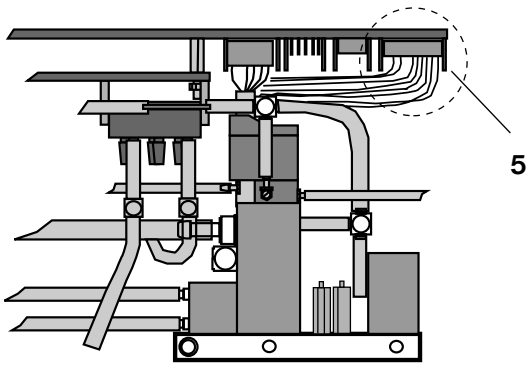
MicroVent:
right side View

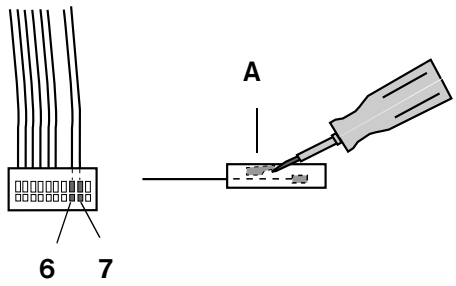


1 from RV 2
2 from Expiratory valve
3 from RV 1

- Disconnect the cable plug-in connector **5** at the bottom of the Control PCB.
- Carefully lift the latch tabs **A** with a small screwdriver.
- Pull out the leads with the pins **6** and **7** from the jack.

Top view





6 black
7 red

- Replace the Expiratory solenoid valve (when connecting the connecting lead 5, make sure the pins are in the correct position) and reassemble the MicroVent using the reverse order for disassembly.

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